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What is the relationship between environmental experiences and New Ecological Paradigm scale of Purdue University undergraduate students?

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WHAT IS THE RELATIONSHIP BETWEEN ENVIRONMENTAL EXPERIENCES AND NEW ECOLOGICAL PARADIGM SCALE OF PURDUE UNIVERSITY UNDERGRADUATE STUDENTS?

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ABSTRACT

Kim, Mi Yen. M.S.Ed., Purdue University, December 2016. What is the Relationship Between Environmental Experiences and New Ecological Paradigm Scale of Purdue University Undergraduate Students? Major Professor: Daniel Shepardson.

After United Nation recognized the necessity for environmental improvement, environmental education (EE) was promoted in schools. Previous studies have found that EE had both positive and negative influences on students' environmental orientation. There were multiple studies that found relationships with environmental behaviors, environmental intentions, environmental activities and environmental orientation. However, not many studies have looked at relationship in overall environmental experiences (EExp) and environmental orientation. This study measured the relationships between Purdue University undergraduate students EExp and environmental orientation using two instruments. A survey was developed to measure students' EExp and NEP scale was used to measure students' environmental orientation. A total of 201 students from five colleges at Purdue University participated in this survey. The results revealed that EA–NEP were stronger than EE–NEP relationship. Students in the College of Science (CS) had strongest correlation in EE–NEP, and EA–NEP relationships than other colleges. Non-Indiana students had stronger correlation in EE–NEP, EAct–NEP, and EA–NEP relationship than Indiana students. Also, female students had stronger EE–NEP, and EA–NEP relationship than male students. Indiana education systems should be studied further to determine a rationale for EE–NEP relationship. The University of Purdue should also study students in colleges other than CS regarding their low correlation in Exp and NEP. With high EA–NEP relationship in Purdue University, more EA opportunities should be included in EE to increase pro-environmental orientation.

1 INTRODUCTION

After the Industrial Revolution began in the 18th century, there was a global change in lifestyle. More technologies were developed to promote convenient living. Steam engines were built, mines were dug, and mass production began. As many in population in developed countries turned away from agriculture to manufacturing, more factories were built and more energy was needed. People started to use automobiles and traveling distance increased. Along with the remarkable developments of humanity in this respect, scientists found new ways to make cost-efficient agricultural produce, and farmers began to use more pesticides and herbicides. But with the scientific development of the 18th century, the Earth suffered through loss of its original green beauty. Many years later, in 1979, the United Nations officially recognized the necessity for improvement in the environment around the world (Higher Education in Europe, 1979). Environmental education (EE) began to be offered around the world with the purpose of bringing environmental awareness and understanding to the people. And scholars and researchers aimed to discover effective methods to influence individuals towards pro-environmental behavior. However, before promoting pro-environmental behavior, it is necessary for scholars and researchers to understand each population's current environmental orientation (using the revised New Ecological Paradigm scale) so that changes can be brought about in an education system or community's attitude towards the environment. Accordingly, this study aimed to identify the relationship between environmental

experiences and the New Ecological Paradigm scale (NEP) in Purdue University undergraduate students as one representative population.

1.1 Environmental Experience

Environmental experience (EExp) in this study includes not only environmental education (EE) but also other experiences people have that are related to nature. The present study included environmental education (EE), environmental activity (EAct), environmental action (EA), and intended environmental action (IEA) as part of EExp. EE includes both formal and informal education. EAct is an activity that an individual engages in with nature, such as visiting a park, or enjoying recreation involving nature. EA is understood as environmental practices that may seem "green" or environmentally friendly. IEA is defined as the intention to engage in EA. Different EExp variables could have diverse influences on individuals' environmental orientation. Thus, this study aimed to determine the relationship between EExp and NEP in Purdue University undergraduate students.

1.2 Problem Statement

Various studies have been conducted to find the relationship between individual EExp variables and NEP. However, there are few studies that have examined the relationships between all EExp variables and NEP. In addition, many studies have been conducted to find the relationships between environmental behavior and NEP, but there have been few studies done on the relationship between environmental practices (EA) and NEP. When individuals have been brought up in a family that promotes pro-environmental behaviors, EAs that individuals undertake may be simply a "practice" for them. With more understanding on the relationships between EA and NEP, it may be possible to promote

more environmental practices in societies to influence NEP and possibly pro-environmental behaviors. Therefore, additional studies should be conducted to determine relationship the relationship between EExp and NEP.

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1.3 Significance of the Study

The study's findings will be important for future generations, because, currently, there are not many studies that draw attention to the relationships between EExps and NEP. Many previous studies have been conducted to discover whether a specific environmental program, intervention or field trip to parks offered at school or outside of school settings have been effective in inducing students' pro-environmental orientation in students. But there is no study that has given attention to cumulative EExp. As EE requires a cumulative learning process, it will be influenced by numerous EExps. The relationship between individuals' EExp and their environmental orientation will show if certain experiences influence their environmental orientation.

The audiences that will likely profit from the present study will be educators who teach and seek to find different methods to promote pro-environmental orientation or behavior in students. This study will also help the general public in the long term. As mentioned before, EE has been encouraged for all countries in the United Nations; nevertheless, the countries have taken different routes to educate their citizens. Currently, the United States is ranked as 33rd on the Environmental Performance Index among 178 countries (Yale University, 2014), and it is 30th among the 34 Organization for Economic Cooperation and Development (OECD) countries (OECD is composed of countries that are industrialized (Redfearn, 1999). This ranking indicates that there may be inefficacy in the United States' EE. If the relationships between EExp and NEP turn out to highlight certain EExp, teachers can promote such experiences. In turn, if this study is successful, it may lead to more studies in other regions and countries that are seeking to identify their region's or country's most influential EExps. Students who learn from those teachers may develop a pro-environmental orientation, which may lead to an improvement in the global environment.

1.4 Purpose of the Study

The purpose of this study was to determine the relationship among Purdue University undergraduate students' EExp and NEP.

1.5 Research Questions

Research Question 1: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) among Purdue University undergraduate students?

Hypothesis 1: There is a stronger correlation between environmental activity and NEP than other environmental experiences and NEP for Purdue University undergraduate students.

Research sub-question 1: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate students in five colleges?

Sub-question hypothesis 1: There is a stronger correlation between environmental experiences and NEP in science-related colleges than in non-science related colleges.

Research sub-question 2: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate students from Indiana, non-Indiana, and international students?

Sub-question hypothesis 2: There is a stronger correlation between environmental experiences and NEP in Purdue University undergraduate students from non-Indiana states than students from Indiana.

Research sub-question 3: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate male and female students?

Sub-question hypothesis 3: There is a stronger correlation between environmental experiences and NEP in Purdue University undergraduate female students than male students.

1.6 Limitations of the Study

The limitations of this study included validity threats because of the small sample size, history, and evaluation apprehension. This study used responses from 201 students, so this small sample size may have resulted in data that does not fully represent the population. As Purdue University is a university that had career fairs, exams, homework assignments, and projects during the data collection, this history may have caused an external validity threat. Also, this study relied on self-reported data on students' environmental education, actions, activities, and orientation. So students may have been tempted to provide more sociably acceptable answers. Also, the demographic composition selected for the participants in the study may be different from that of other universities and colleges. Therefore, the results of this study only apply to this study.

1.7 Definitions of Terms

This study focused on the relationship between EExp and NEP. Terminology definition is needed to clarify term usage in the study. Following is a list of the terms used:

1. Environmental experience (EExp): This term was used to mean insight into certain environments (Ryan, 2005). In this study, environmental experience refers to any involvement in the surrounding environment. This may include environmental education, environmental activity, environmental action, and intended environmental action.
2. Environmental education (EE): This term was used in Brown (2009) to mean education that has the purpose of promoting environmentally sound behaviors. This study used EE to mean any method through which participants have been able to

obtain environmental information and could include both formal and informal environmental education.

3. Environmental activity (EAct): This referred to activities designed to increase consciousness about the environment (Tal, 2013). In this study, EAct refers to opportunities for pro-environmental interaction with nature.
4. Environmental action (EA): This term was also used in Tal (2013) to mean actions taken to improve the surrounding environment. EA in this study has also been used to describe the self-reported environmental action that students have done to improve the surrounding environment. However, this study emphasizes the practices that have become a habit for students rather than their environmentally sound behaviors.
5. Intention towards environmental action (IEA): This term has not been used in the literature with the same exact wording. Swaim, Maloni, Apshin and Henley (2014) used the term "sustainability plans" (p. 467) for the same meaning. In this study, IEA was used to signify students' intention towards environmental friendly actions.
6. The New Ecological Paradigm scale (NEP): This was an instrument developed and revised by Dunlap, Van Liere, Mertig, and Jones (2000a) to represent environmental orientation. A higher NEP score indicated higher pro-environmental orientation. Thus, a high pro-environmental orientation indicates a high score in NEP, while a low pro-environmental orientation indicates a low score in NEP.

2 LITERATURE REVIEW

2.1 Chapter Overview

After there was recognition throughout the world of the necessity for an environmental education, many studies were conducted to discover effective methods to influence students, who are future decision makers, to become more committed to the environment. These studies mostly recommended environmental education along with environmental activity that requires interaction with nature. Numerous environmental programs were created globally to target specific populations and specific environmental issues. Researchers used pre and post tests and also delayed post tests to measure the effectiveness of environmental programs. Along with environmental programs, many instruments were created to measure participants' environmental attitudes, behaviors, experiences, knowledge, and the New Ecological Paradigm (NEP). For the purpose of the present study, this section focuses on environmental experience along with NEP. The survey instruments can be found in Appendix C.

EExp in the literature can be divided into two major criteria: EE and EActs. EE includes both formal and informal education. Scribner and Cole (1973) described formal education as environmental programs held in classroom settings by trained teachers or guides. Informal education was described by them as environmental information provided to students outside of classroom settings: visiting nature exhibits and zoos or reading environmental books, for example. EActs includes visiting parks, gardening, and

enjoying recreation in nature. The literatures on both EE and EAct aimed to discern the relationship between EExp and participants' NEP. EA and IEA have not been used in the literatures as independent indicators for environmental orientation. EExp including EE and EAct, have been used to predict EA and IEA.

2.2 Literature Review Methodology

The present study looked at the multiple studies done since there began to be a global recognition of EE in the late 1970s. a direct search in the Purdue University library direct search, Purdue University library as well as a search through the library catalog, and a search through Google Scholar were used to find references. Examples of terms and phrases used for searching the literature were: "environmental education," "New Ecological Paradigm," "environmental experiences," "formal environmental education," "informal environmental education," "nature and environmental education," and "environmental behaviors."

2.3 New Ecological Paradigm

Dunlap and Van Liere (1978) developed an instrument that measured pro-environmental orientation and they called it the New Ecological Paradigm, or NEP. The NEP scale uses 12 Likert-scale item that focused on three ecological aspects: "'limits to growth,' 'balance of nature,' and 'anti-anthropocentrism' (Dunlap, Van Liere, Mertig, & Jones, 2000). Limits to growth refers to idea that Earth has limited resources. Balance of nature refers to idea that living organisms should have balance. Anti-anthropocentrism is an idea that humans are only part of nature, not the most important specie. NEP has received researchers' support since its development for its validity in measuring participants' pro-environmental

orientation. Dunlap, Van Liere, Mertig, and Jones later (2000a) revised the NEP scale to improve the "directionality imbalance in the original NEP scale" and also to better address recent global environmental concerns (p. 431). The revised NEP scale uses 15 Likert-scale items and includes more anti-anthropocentrism questions. Along with three ecological aspects, the revised NEP scale includes "human exemptionalism" and "ecocrises" (Dunlap, Van Liere, Mertig, & Jones, 2000a, p. 432). Human exemptionalism refers to idea that humans are free from law of nature. Ecocrises refers to idea that there is a potential for catastrophic changes in environment that may have influence on man-kind. This revised NEP scale has been used globally, since its development, to measure participants' pro-environmental orientation.

2.4 Environmental Experience and NEP

Environmental experience in this study includes environmental education (EE), environmental activity (EAct), environmental action (EA), and intention towards environmental action (IEA). In past studies, many researchers have focused on the relationship between EE and NEP. But recent studies have begun to highlight the relationship between EAct and NEP. Studies often used EA and IEA as outcome of environmental knowledge and attitude. However, Hines et al. (1987) found that EA was an indicator of responsible environmental behavior. This researcher also indicated that IEA was situational. As EExp was used for involvement with nature in this study, IEA has been included in EExp because students' IEA may have changed as well as their involvement in nature. Carida (2011) indicated that actions that have become habits may influence

intention for actions to change. This section highlights the historical findings on four EExp and NEP relationships.

2.4.1 EE and NEP

The literature on EE includes studies on both formal and informal education. Formal EE covers EE programs offered in a classroom setting while informal EE covers trained guides or teachers offering EE programs outside the classroom setting, including reading books. Arcury, Johnson and Scollay (2010) revealed that EE and NEP showed a positive correlation. Students had more pro-environmental orientation with more EE. Woodworth, Steem-Adams, and Mittal (2011) also found that EE and NEP were positively correlated. Their study emphasized that students with less pro-environmental orientation increased their NEP scores more than students who already had high pro-environmental orientation. Students' environmental orientation positively increased after a semester of environmental courses (Kuo and Jackson, 2014). Studies also revealed that female students showed a stronger correlation between EE and NEP (Anderson et al., 2007; Zelezny & Aldrich, 2000). Casey and Scott (2006) also revealed that participants with more education showed a higher correlation between EE and NEP. Hovardas and Korfiatis (2012) had a different result; they found that EE had no influence on students' environmental orientation. Their NEP scores did not change after the course because respondents already had high pro-environmental orientation.

Casey and Scott (2006) also demonstrated that participants with more education showed higher correlation between EE and NEP. However, Boo and Park (2013) found that a lower

level of education did not necessarily indicates less knowledge of responsible environmental behavior.

2.4.2 EAct and NEP

EAct can mean visiting parks, painting scenery, bird-watching, or enjoying sports in natural settings. Students who had high pro-environmental orientations (higher NEP) were found to enjoy and perform EAct that were "appreciative" and "motorized" (Thapa, 2010, p. 143). Students who were technocentric, or students that believed "technological innovations can solve problems", had less pro-environmental orientation (lower NEP) and did not participate in EAct (Thapa, 2010, p. 143). Bjerke, Thrane and Kleiven (2007) also found that participants who had more pro-environmental orientation enjoyed EAct to a greater degree than participants with less pro-environmental orientation. Uysal, Jurowski, Noe, and McDonald (1994) revealed in their study that visitors, particularly female visitors, to a national park, St. John's, in the West Indies (Caribbean), had higher pro-environmental orientation than male visitors.

2.4.3 EA, IEA and NEP

The literatures on EA, IEA and NEP relationships does not use EA, or IEA as indicators for environmental orientation (NEP). Instead, the literatures used the term environmental behavior, for EA in discussing the direct and indirect actions individuals taken in nature. Many studies used NEP to determine EA (Tarrant, & Cordell,1997; Casey, & Scott, 2006; Fryxell, & Lo, 2003; Johnson, Bowker, & Cordell, 2004; Lee, & Paik, 2010; Mobley, Vagias, & DeWard, 2010). These studies indicated a positive correlation between NEP and environmental behavior.

IEA also used NEP in interpreting participants' intentions toward environmental action. (Lee & Jan, 2015). However, EA and IEA were included in EExp in this study to represent students' historical involvement with nature besides their EE and EAct.

2.5 Environmental Experience relationship

EExp is related to NEP and four of the EExps also show relationships with each other. Many studies focused on environmental behavior, to determine ways to be used to promote pro-environmental behavior. As indicated above, researchers used environmental behavior instead of EA to represent individuals' actions toward nature. Studies were also conducted on IEA to lead to improvements in the environment.

2.5.1 EE and EAct on EA

EA, or environmental behaviors, as used in the literatures, along with EE relationships have been highlighted in multiple studies. Meyer (2015) found that more EE increased environmental behavior because education in general teaches individuals about increases in costs and energy usage as a consequence of poor environmental behaviors. Vicente-Molina et al. (2013) also revealed that EE and environmental behavior were positively correlated. Dvorak et al. (2011) surveyed graduate students to find out if environmental education had a positive influence on their environmental behavior. These students remembered the environmental education program that was offered at the university and subsequently performed pro-environmental behaviors on a daily basis. Duerden & Witt (2010) conducted a study to discover environmental education's influence on students' environmental behavior. Their findings suggested that with an environmental education program offered outside of the classroom setting, including traveling across another

country, students' environmental behavior improved. Arnocky and Stroink (2011) conducted a study to determine the relationship between university students' major and their environmental concern, cooperation and behavior. Students with a major in outdoor recreation or parks and tourism displayed more environmental concern, cooperation, and behavior than students with a major in psychology. This study revealed that differences in environmental behavior may exist in group of individuals who are majoring in different fields.

Although multiple studies found that students EE and EA were correlated, there have been studies that did not find a relationship between EE and environmental behavior. Environmental behavior did not improve in students after obtaining environmental knowledge through a documentary, according to a study conducted by Arendt and Matthes (2016) on participants who were already had a pro-environment attitude. Ferreira (2012) did a study on the influence of environmental education on students in Canada who were exposed to an environmental education in Great Smokey Mountains area. The program provided to the participants did not prove to have an influence on their environmental behavior.

Multiple studies have concluded that when students have more direct experiences with nature, they are more likely to engage in pro-environmental behaviors (Halpenny, 2010; Lee & Jan, 2015b; Collado & Corraliza, 2015, Tarrant & Green, 1999; Ballantyne et al., 2011; Collado et al., 2013). Tarrant & Green (1999) asserted that students are more likely to bring personal meaning to nature when they have more contact with nature, and that this could lead to more pro-environmental behavior. This study also found that female participants showed higher correlation among these items than male participants.

Ballantyne et al. (2011) stated that recreation experiences in nature promotes connectedness to nature, which also promotes pro-environmental attitudes and behaviors. Farmers participated in a study to determine the relationship between connectedness to nature and environmental behavior. This group of individuals that performs EActs daily. However, farmers' connectedness to nature and their behavior did not show a correlation in a study conducted by Gosling and Williams (2010). The present study indicated that although individuals may perform EAct, if it is not pro-environmental EAct, they may not exhibit responsible environmental behavior.

2.5.2 EE and EAct on IEA

A study on the relationship between EE and IEA is controversial. Bergman (2015), Boo and Park (2013), and Fröhlich et al. (2013) indicated that there was a positive correlation between EE and IEA. However, these correlations were too low to support a hypothesis that emphasized a relationship between EE and IEA. Other studies also exist that indicated no correlation between EE and IEA. In a study conducted by Hadjichambis et al. (2015), for example, they examined students' environmental knowledge and IEA and found that there were no correlation between these two variables.

Kafyri, Hovardas, and Poirazidis (2012) found that tourists visiting some of the 2000 Greek islands had a high level of IEA. However, this study only included participants on a tour of Greek islands; therefore, it is not possible to say that the high IEA level of these tourists was due to EAct.

2.6 Need for the Study Based on Literature Review

Previous studies have been successful in finding influences of environmental education programs in schools, outside of schools, and in environmental or nature experiences for students. However, these studies only focused on specific environmental programs offered in school settings or outside school settings such as nature centers and environmental experiences in parks or natural settings. As mentioned above, Hines et al. (1987) viewed EA as an indicator of environmental behaviors. EA, as well as environmental practice, could also be used to indicate NEP. However, there are studies that look at the EA and NEP relationship, which distinguishes environmental orientation from environmental action. Moreover, there are few studies that have looked at the relationship between multiple EExps and NEP. Environmental orientation, as mentioned in the description of NEP, is comprised of five ecological aspects. Although EE offered by schools and other institutions is the main methods used to improve students' environmental orientation, other EExps may have a relationship to environmental orientation as well. Therefore, this research focused on gaining a deeper understanding of the EExps and NEP relationship. These research findings may, thus, enable improvements in environmental education because they will highlight the the relationships that exist in not only among EE, EAct, and IEA.

3 METHODOLOGY AND METHODS

3.1 Introduction

This chapter serves as an overview of the research procedure and methodology employed in this paper including the development of the survey. The chapter includes a discussion of the purpose, instrumentation, and research design and validity. The rationale for making a decision on participant selection, which consisted of university, college, and student selection, along with the rationale behind the selection, are also included in this chapter. The instrument used in the study will be described along with its reliability and validity measures. Finally, the data collection procedure, its management, and the analysis procedures will be described in this chapter.

3.2 Purpose of the Study

The purpose of this study was to determine the relationship among Purdue University undergraduate students' EExps and their environmental orientation (NEP).

According to Ferreira (2011), students with more environmental experiences will exhibit more positive environmental behaviors and paradigms. Students in colleges related to science may have been exposed to more EExps. According to Dunlap et al. (1978), students who had greater exposure may be more positive EExps and orientation than students in non-science-related colleges. Students at a higher level in college, such as seniors, may have more pro-environmental orientation because they may have been

exposed to more science courses and environmental aspects. However, there has been no research comparing different EExps and students' environmental orientation.

The main research question's hypothesis, according to Ferreira (2011), is that the more EExps a student has, the more likely the student is to have more positive environmentally friendly behaviors and paradigm because EE is a continuous learning process. Along with this hypothesis, a sub-question has also been set. The students in colleges related to science may have been exposed to more EExps. According to Dunlap et al. (1978), more exposure to environmental orientation for students of science may be more positive than for students of non-science related colleges.

3.3 Research Design

This study used a quantitative research design to determine the relationship between EExps and environmental orientation (NEP). The research questions were analyzed using the path analysis created in this study. The rationale behind this decision was to help answer the research questions related to EE–NEP, EAct–NEP, EA–NEP, and IEA–NEP, which this model shows.

3.4 Institutional Review Board Approval

To protect the participants' rights, the researcher completed the CITI program online training on the Protection of Human Research Subjects online training for Social Behavioral Research for Investigators and Key Personal Learner Group.

The first step after completion of the CITI program is to receive an Institutional Review Board (IRB) approval from Purdue University. Completed questionnaires, an exempt form, a research consent form which includes brief information regarding the research, and a

research involving students or educational settings form has to be submitted to IRB. Description of the target participants and my research focus was also submitted. IRB approval of a research exemption was granted for "What is the relationship between environmental experiences, environmental behavior and environmental paradigm?" the original name of the research, on March 9, 2016 with IRB protocol number 1601016995 (Appendix A).

3.5 Participant Assent and Consent

The researcher elicited informed consent from the participants before they took part in the research. The IRB-approved message was added as the first question on the online survey before they could have access to any of the other questions. The consent form included information regarding the research, purpose of the study, description of the procedures, and foreseeable risks and benefits to the subjects or others. Although every target participant received email invitations that briefly mentioned the purpose of the survey, the consent form page included the purpose of the research to ensure that participants were aware of their place in this research. The last sentence of the consent form page said, "By clicking YES you are verifying that you have read the explanation of the study and that you agree to participate. You also understand that your participation in this study is strictly voluntary." The participants gained access to the rest of the questions only when they clicked "yes." The email invitation sample can be found in Appendix B.

3.6 Selection Criteria

This study required participants at the college level who had opportunities to engage in formal and informal EE. As the study used an online questionnaire that is distributed

through email, all participants needed to have access to an email account. The information below provides a description of the university selection, college selection, and student selection.

3.6.1 University Selection

Purdue University is a public institution located in the Midwest region of the United States. According to the Purdue University Enrollment Summary, in fall 2015, there were a total of 29,497 students. Although a census study was possible to maximize the research findings, the sample size has been limited. The colleges were chosen in accordance with the number of students. The College of Science and the College of Health and Human Sciences were the two science related colleges at Purdue that had the largest population of students in the university. The College of Liberal Arts and the Krannert School of Management were the two non-science related college that had the largest population of students in the university. The College of Engineering was also chosen due to its significantly large proportion of the student population at Purdue, namely, one third of the total student population.

3.6.2 College Selection

The two colleges for science were chosen to represent the Purdue University's undergraduate students who were seeking degrees in science or who were required to take science courses in their major area of study as well as outside of their major area. The extent of the relationship of the science courses to the environment was not measured. However, there is a question on the survey that asks students to identify whether they have taken any environment-related courses at Purdue University.

The two colleges that were not science-related were chosen to represent to Purdue University's undergraduate students who were seeking degrees in non-science areas. These students may have had little exposure to science courses and especially science courses related to the environment. These students were chosen to avoid bias which would have taken place if only the students in science-related colleges were selected. The results from the college students in non-science areas will represent the students who may have been less exposed to EExps.

CE was selected, as mentioned before, because of its large population. However, its unique stand between science and non-science was also a reason for its selection. According to Yueh (2013), scientists and engineers seem to be very similar in that they both require scientific knowledge and imagination. But Yueh pointed out that the National Society of Professional Engineers defined the differences between scientists and engineers in their goal and methods,

> Science generally refers to knowledge based on observed facts and tested truths which are arranged in an orderly system that can be validated and communicated to other people. In contrast, engineering usually refers to the creative application of scientific principles used to plan, build, direct, guide, manage or work on systems to maintain and improve our daily lives (p. 80).

Because of this difference, CE was not selected as a college related to science. Although they take multiple science courses and possibly some environmental related science courses, the courses' overall influence on each student may not be the same as that on students in science-related colleges.

3.6.3 Student Selection

After students' e-mail addresses were collected, they were put in order alphabetically by last names. So as to avoid systematic bias, which according to Schutt (2015) is "overrepresentation or underrepresentation of some population characteristics in a sample resulting from the method used to select the sample" (p. 157), systematic random sampling was used to select the samples. This type of sampling requires, first, subjects to be selected randomly and, second, every nth number to be selected from the population. Twenty-five hundred students were selected out of the total university population. The total population in the target colleges in the year of data collection was 25,476 students, including all undergraduate students. The starting student was the 4^{th} person and every 25.5^{th} person was selected. Since the sampling interval was 25.5, the sampling alternated between the 25^{th} and the 26^{th} student. Emails were then sent to each student (n=2500) via his or her Purdue e-mail address.

3.7 Demographic Characteristics of the Participants

A total of 298 students from Purdue University participated in the study. However, of the 298 responses received, 97 responses were discarded because the majority of the questions necessary to carry out the analysis had not been answered. Thus, there were 201 responses, which is an overall 8 % response rate. These students were undergraduate students in the College of Science (CS), College of Engineering (CE), College of Liberal Arts (CLA), College of Health and Human Sciences (CHHS), and Krannert School of Business (KSB). The colleges each had different response rates. The CS response rate was the highest with 10.4% (n=52), while the KSB response rate was the lowest with 5.0% (n=25). The CLA

response rate was 9.0% (n=45), the CE response rate was 8.8% (n=44), and the CHHS response rate was 7.0% (n=35). The demographics questionnaire included gender, year in college, major, ethnicity, and geography (of where they received most of their education). The CS participants were composed of 63.5% males and 36.5 females; CLA, 31% males and 68.9% females; KSB, 60% males 40% females; CE, 72.7% males and 27.3% females; and HHS, 11.4% males and 88.6% females.

Of the 201 student participants, 60.2% received a majority of their education in Indiana, 32.8% in other states in the U.S., and 7% in other countries including China, India, Singapore, India, Kuwait, Malaysia, and Japan.

Regarding ethnicity, 0.5% were American Indian or Alaskan Indian, 10.9% were Asians, 1.5% were Black or African American, 76.6% were White, 13.65% were Hispanic, and 2.5% did not answer this question.

Most participants, 171 students, have indicated that they had received the majority of their education in the United States, while 20 students indicated otherwise.

Table 1 displays the detailed demographic information regarding the survey participants. As the research participants were students at a university, they had at least a high school or college-level of education, depending on their year in college.

Table 3.1 Summary of Demographics

		CS	CHHS	CLA	KSB	CE	ALL
Sample Size (Response Rate %)		52 (25.9)	35 (17.4)	45 (27.4)	25 (12.4)	44 (21.9)	201 (8)
Gender n (%)	Female	19 (36.5)	31 (88.6)	31 (68.9)	10 (40)	12 (72.7)	103 (51.2)
	Male	33 (63.5)	4 (11.4)	14 (31)	15 (60)	32 (27.3)	98 (48.8)
Class Rank n (%)	Freshman	7 (13.5)	3 (8.6)	5 (11.1)	2 (8.0)	10 (22.7)	27 (13.4)
	Sophomore	16 (30.8)	10 (28.6)	10 (22.2)	6 (24)	13 (29.5)	55 (27.4)
	Junior	11 (21.2)	12 (34.3)	12 (26.7)	4 (16)	11 (25)	50 (24.9)
	Senior	18 (34.6)	9 (25.7)	18 (40)	13 (52)	10 (22.7)	68 (33.8)
Race n (%)	Asian	5 (9.6)	0 (0)	6 (24)	5 (11.1)	6 (13.6)	22 (10.9)
	Alaskan Indian or American Indian	1 (1.9)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)
	Black/African American	1 (1.9)	0 (0)	0 (0)	1 (2.2)	1 (2.3)	3 (1.5)
	Hispanic/Latino	2 (3.8)	3 (8.6)	2 (8)	2 (4.4)	4 (9.1)	13 (6.5)
	White	39 (75)	29 (82.9)	17 (68)	4 36(80)	32 (72.7)	154 (76.6)
	Unanswered	2 (3.8)	1 (2.9)	0 (0)	1 (2.2)	1 (2.3)	5 (2.5)
Geography n (%)	Indiana	29 (55.8)	27 (77.1)	36 (80)	11 (44)	18 (40.9)	121 (60.2)
	Non-Indiana	16 (30.8)	8 (22.9)	8 (17.8)	12 (48)	22 (50)	66 (32.8)
	International	7 (13.5)	0 (0)	1 (2.2)	2 (8)	4 (9.1)	14 (7)

Note. CS=College of Science, CLA=College of Liberal Arts, KSB=Krannert School of Business, CE=College of Engineering, CHHS=College of Health and Human Sciences, n=number of participants.

3.8 Instrumentation

As interest in EE has increased, many surveys have been developed to measure selected environmental experience, knowledge, orientation, attitude, and behavior (Bogner, 1998; Bogner, & Wilhelm, 1996; Dunlap, et al., 2000b; Kinsey, & Wheatley, 1980). Among these surveys, the NEP scale is the most widely used survey to measure environmental orientation. NEP scales have been used to determine the effectiveness of EExps (Hawcroft, 2010; Nooney, 2013; Peterson, 2008; Wu, 2012). This study focused on environmental experience and orientation.

The literature review showed that there was no single instrument that fit the objectives of this research. The survey instrument used in this study included four parts: EE, EAct, EA and IEA. Among the previously mentioned surveys, the NEP scale was selected for use in the present study to determine students' environmental orientation.

The survey consists of 80 questions with 13 questions on demographics. The remaining 67 questions are divided into four categories: EE, EA, EAct, and NEP. The sections are organized in this way to avoid the context effect. According to Schutt (2015), context affects the possibility of answering a question which can influence the answering of another question. Answering a question about EExp such as "Have you ever participated in a nature conservation activity, such as monitoring water quality or species and habitats restoration?" may influence the answer to an EA question such as "I recycle." If a participant answered "yes" to the EExp question, which asked about his or her participation in EAct, the student may feel obligated to indicate that he or she frequently recycles even when this is not true. Skip pattern questions were also used on the survey. According to Schutt (2015), skip pattern filtered questions allowed participants to avoid answering a question that they

cannot relate to. With an online survey, the skip pattern survey was easier for the participants to use than the skip patterns on a paper survey. Most questions on the survey were close-ended questions. Some EExp questions consisted of open-ended questions to allow participants to share more EExps that were not listed on the survey.

The first question after the demographics question asks, "If you were to score your environmental behavior, what score would you give yourself?" This question was the only question that allowed the rating scale to be used for individual participants to answer and it allowed the participants to see whether they see themselves gearing towards having positive or negative environmental behavior more than if the answer choices were multiple-choice. There are two ranking questions in the survey, which asked the participants to determine the most important source for their environmental knowledge and the source of environmental information that most affects their environmental behavior. These questions could not accurately reflect the necessary data on individual students' attitudes towards their most important sources if this question were a multiple choice question in which participants were asked to determine their most important source. The ranking helped the researcher to see which sources were considered important relative to each other.

3.9 New Ecological Paradigm (NEP) survey

The New Ecological Paradigm scale, developed by Dunlap, VanLiere, Mertig, and Jones (2000b), is a reliable instrument that shows the relationship between EExps and environmental orientation and has been used in many studies throughout the world (Casey & Scott, 2006; Dunlap, et al., 2000b; Harraway, Broughton-ansin, Deaker, Jowett, and

Shephard, 2012; Hawcroft & Milfont, 2010; Kaiser, Hubner, & Bugner, 2005; Schultz, Unipan, & Gamba, 2000; Wu, 2012).

The NEP survey section used questions from the revised NEP Scale (Dunlap, Van Liere, Mertig, & Jones, 2000a). It is composed of 15 questions and used a 5-point Likert scale divided into five parts: "the reality of limits to growth," "antianthropocentrism," "fragility of nature's balance," "rejection of exemptionalism," and "possibility of an ecocrisis." The 8 odd-numbered questions indicated positive environmental orientation if participants agreed with the statement, and the 7 even-numbered questions indicate positive environmental orientation if students disagree with the statement. Higher scores on the 15-item NEP scale thus indicated stronger positive environmental attitudes.

3.10 Environmental Experiences

The EExp questions were divided into three parts: EE, EAct, EA and IEA. Question 14 included 26 Likert items. The Likert items used in this survey employed the bipolar response option. According to Schutt (2015), this option had a middle category with a balance of positive and negative choices. A 7-point Likert scale was used for the behavior questions to obtain more detailed results. The 7-point Likert scale questions asked the participants, "How often do you do these activities?" with 7-point Likert items such as "never," "hardly ever," "seldom," "sometimes," "generally," "frequently," and "always". The 25 questions after Question 14 were mostly dichotomous questions with some ordinal questions where participants answer by placing in order words that describe their source of environmental knowledge.

3.10.1 Environmental Education

The EE questions included questions 14.3, 14.6, 21, 22, 24, 25, and 34-40. These questions focused on students' actions towards learning environmental information. They do not measure students' environmental knowledge but rather measure their past EE experiences. As question 14 is a 7-point Likert item question, answers vary from 0-6 for each question while dichotomous questions vary from zero. Unanswered questions were marked as zero.

3.10.2 Environmental Action

The survey included questions that sought to elicit participants' EAs: questions 14.1, 14.2, 14.4, 14.5, 14.7-14.9, 14.11-14.13, 14.15, 14.17, 14.20-14.26, and 17-20. Questions 14.20 and 19 were different from the other questions because their responses to them would have opposite meanings. As question 14 is a 7-point Likert item question, answers vary from 0-6 for each question, while dichotomous questions 17-20 vary from 0 to 1. Unanswered questions were marked as zero.

3.11 Environmental Activities

The survey included questions regarding EActs. These questions measured students' past activities outside of the classroom and in nature. Questions 14.14, 14.16, 14.18, 14.19, 16, 26-31, and 33 counted towards EActs. Question 14 is a 7-point Likert scale question and answers vary from 0-6. Questions 16-31 vary from 0-1 as a dichotomous question except for questions 26, 28, and 30, which ask how often students carried out EActs; and the responses to these questions vary from 0-4. Question 33 asked participants to indicate which outdoor activities they enjoy and allowed them to mark as many as they wanted.

Students were also provided with an opportunity to make an open-ended comment if they have more activities they enjoy.

3.12 Content Validity

Content validity was checked using SPSS 23 to find internal consistency with Chronbach's alpha coefficient. Reliabilities for the four EExp ranged from questionable to good internal consistency. The reliability for NEP had acceptable internal consistency (Table 3.2).

Table 3.2 Alpha coefficient from the Content Validity Index

Content		α
Environmental Experiences	Environmental education	0.628
	Environmental activity	0.689
	Environmental action	0.861
	Intention towards environmental action	-
NEP	Environmental orientation	0.701

3.13 Data Collection

All participants were drawn from a list of Purdue University's undergraduate students in the previously mentioned colleges using systematic random sampling. All Purdue University's undergraduates have Purdue email accounts; therefore, all survey invitations were sent out using email. The survey method allowed questions to be asked using different methods. Particularly with online survey questionnaires, it was easier to devise and answer skip-pattern questions. As Schutt (2015) mentioned in his book, a good survey can "enhance our understanding of just about any social issue" (p.153). Upon request, Purdue University's administration office provided a for research purposes of Purdue undergraduate students in those colleges along with their name, email address, and their college. After students' e-mail addresses were collected, then they were put in order alphabetically by students' last names. To avoid systematic bias, which according to Schutt

(2015) is "overrepresentation or underrepresentation of some population characteristics in a sample resulting from the method used to select the sample" (p. 157), systematic random sampling, as mentioned previously, was used to select the samples. This type of sampling required the first subject to be selected randomly and every nth number to be selected from the population. Out of the total pulopulation in the previously mentioned five colleges, 2,500 students were selected. The total population in the target colleges was 201 students, including all undergraduate and graduate students. The starting student was the 4th person and every 25.5th person was selected. Since the sampling interval was 25.5, the sampling alternated between the 25th and 26th student. After 2,500 students were determined, eight emails were sent to the students to the participation in this study. They received four emails asking them to participate in the study throughout two semesters, spring 2016 and fall 2016, and another four emails were sent after three days of initial email invitations reminding them to complete the survey.

This research is different from other quantitative research studies in that it does not include intervention or manipulations, so it did not have a pre-test or a post-test and did not focus on a specific environmental program or experience. The research focused only on students' past four EExps and thus only one survey to be administered to the them.

The questionnaires were administered online, using Qualtrics, a research software program designed for versatility, efficiency, and generalizability. A pilot survey was conducted with several graduate students in March 2016 which did not require them to answer each question but rather asked them to review the questions for possible amendments. In light of the pilot survey, changes were made in the wording of the questions and the placement of certain questions. In mid-February, the online survey and proposal were submitted to

Purdue University's Institutional Review Board (IRB) to allow the online survey to be distributed to the selected students. The IRB approved the survey in early March (before the pilot) and email invitations were sent out four times: at the end of March, end of April, and beginning and end of October.

As the survey was sent out to students online, it was up to the students to open the email and answer the questions. Table 3.1 provides an overview of the indexes for all five colleges.

3.14 Data Management

The collected data were stored in Qualtrics in accordance with the IRB report. The data were then exported to Excel to be used for data analysis.

3.15 Data Analysis

The research used Statistical Package for the Social Scientist (SPSS) version 23 and Jupyter Messaging Protocol (JMP) version 12 to code and analyze the participants' responses. JMP was used to find correlation between EExp and NEP. SPSS was used to analyze the multiple regression. The multiple regression analysis results were used to find the path analysis that was needed to construct the model. This analysis also found R^2. According to Dancer and Tremayne (2005), R^2 is a "reference to the coefficient of determination" in a multiple regression analysis that shows how well a model represents the real data. Model construction was done with Analysis of Moment Structures (AMOS) using results found with SPSS.

This study included three demographic variables, four EExps, and NEP to use in answering the research questions. Demographic variables included colleges, educational background

by region, and gender. These demographic variables were nominal measures. The four EExps (EE, EAct, EA, and IEA) were independent variables that were analyzed to find their relationship with NEP. The four EExps and NEP variables were ordinal measures. The collected data were recorded on an Excel file. The missing data were replaced with zero if a student had no EExp for a particular question. Data that did not include IEA were excluded from the data analysis. Demographic variables that indicated two colleges for one individual were also excluded from the analysis.

Multiple survey question types were used to find EE, EA and EAct: 7-point Likert scale, 5-point Likert scale, multiple choice, dichotomous, rating scale and rank order. Survey questions on a 7-point Likert scale were used to indicate frequency of obtaining EE, performing EA, and participating in EAct. Scales ranged from 0 (never) to 6 (always). One negatively worded question was reversed for scoring. Multiple choice questions and dichotomous questions were used to find EExp in EE, EA, and EAct. Multiple choice question responses determined frequency of students' EAct. These questions ranged from 0 (never) to 4 (more than 15 times a year), 1 (once a year), and 6 (daily). Questions on a 5-point Likert scale questions from the revised NEP scale developed by Dunlap, Van Liere, Mertig, and Jones (2000a) were used to determine students' environmental orientation. NEP questions asked students to rate their level of agreement on statements regarding five environmental aspects. These questions ranged from 1 (strongly disagree) to 5 (strongly agree). Dichotomous question responses ranged from 0 for "no" and 1 for "yes" but negatively worded questions were reversed for scoring purposes. Questions that provided the option, "not sure", were scored as "no". One multiple choice question asked students to select activities that they enjoy. This question allowed them to write activities that were

not listed on the choices. Other than this question for EExp and NEP questions, all were closed questions. A rating scale question that asked for students to rate their environmental behaviors ranged from 0 (not environmentally friendly) to 10 (very environmentally friendly). Two rank order scales were also provided to determine most important source of environmental information as well as to determine the most influential source of information for student's environmental behavior. Questions asking about their most important source of environmental information were excluded from the data. Questions that asked students to rank their most influential source for environmental behavior, were scored as 0 if students answered "nothing affects my environmental behavior" and as 1 if other answers were given. Scores for EExp and NEP variables were summed to represent each variable. These four EExp scores were categorized on Excel into each demographic variable.

Raw numeric data on Excel were exported to SPSS and JMP for data analysis. Multivariate correlation analysis was done to determine the relationships among the four EExps and NEP using multivariate. According to Greenfield, Kuhn, and Wojtys (1998), correlation analysis provided "strength between two variables" (p. 338). Derhab and Bouras (2014) have used multivariate correlation analysis to find the relationship between two variables. Multiple regression analysis between four EExp variables and NEP was used to build path diagrams for each demographic variable. Correlations between four EExp variables and NEP were used to determine which EExp had a stronger correlation with NEP and were also used to compare demographic variables.

Table 3.3 Research Questions, Variables, and Statistical Data Analysis Methods Overview

#	Research Question	Hypothesis	Variables		Data Analysis
			IV	DV	
1	What is the relationship between EExp (EE, EAct, EA, and IEA) and NEP in Purdue University undergraduate students?	There is a stronger correlation between environmental activity and NEP than other environmental experiences for Purdue University undergraduate students.	EE EAct EA IEA	NEP	Correlation, Multiple Regression, Path Analysis
1a	What is the relationship between EExp (EE, EAct, EA, and IEA) and NEP in Purdue University undergraduate students in five colleges?	There is a stronger correlation between environmental experiences and NEP in science related colleges than non-science related colleges.	EE EAct EA IEA	NEP	Correlation, Multiple Regression, Path Analysis
1b	What is the relationship between EExp (EE, EAct, EA, and IEA) and NEP in Purdue University undergraduate students from Indiana, non-Indiana and international students?	There is a stronger correlation between environmental experiences and NEP in Purdue University undergraduate students from non-Indiana states than students from Indiana.	EE EAct EA IEA	NEP	Correlation, Multiple Regression, Path Analysis
1c	What is the relationship between EExp (EE, EAct, EA, and IEA) and NEP in Purdue University male and female undergraduate students?	There is a stronger correlation between environmental experiences and NEP in Purdue University undergraduate female students than male students.	EE EAct EA IEA	NEP	Correlation, Multiple Regression, Path Analysis

Note. EE= Environmental Education, Eactv=Environmental Activity, EAtt=Environmental Attitude, IEA=Intended Environmental Action, EA=Environmental Action, IV=Independent Variable, DV=Dependent Variable

4 RESULTS

4.1 Introduction

Chapter 4 included information regarding the findings from the analysis. The research looked at students' EE, EAct, EA, IEA and NEP. This chapter showed the data analysis which addresses the main research question as well as the three sub-questions. The data shown in this study are presented using SPSS 23 and JMP 12 for Windows. Correlation analysis has demonstrated the relationship between EExp and NEP, and multiple regression analysis has demonstrated which EExps could be used to predict NEP for Purdue University undergraduate students (goodness of the model fit) (Table 4.1). Path analysis was done to create the models, using AMOS. The models showed how EExps could be used to predict NEP in Purdue University undergraduates.

4.2 Results for research question 1: Purdue University undergraduate students' relationship between EExp and NEP

Given the low R^2 value, EExps were not a strong predictor NEP in Purdue University undergraduate students ($R^2 = 0.19$). Correlation analysis was used to find the relationship between EExp and NEP. Among the EExp–NEP correlation in Purdue University undergraduate students, two EExps were moderately and significantly correlated with NEP: EE–NEP ($r = 0.349$), and EA–NEP ($r = 0.307$). EAct and IEA were positively correlated with NEP as well, but not significant. EE had stronger correlation with NEP

than other EExps. Multiple regression analysis was used to determine the EExp predictors for NEP. The strongest predictor of EExp in the EExp–NEP model was EA (β = 0.344). EE (β = 0.337) was a moderate and significant predictor for NEP. EAct (β = -0.303) and IEA (β = -0.163) were significant though negative predictors for NEP. Correlation and multiple regression analysis results were used in AMOS to construct the model. This model demonstrated the relationship between EExps and NEP (Figure 1).

4.3 Results for sub-question1: Purdue University undergraduate students' relationship between EExp and NEP in CS, CHHS, CLA, KSB, and CE

Models for the five selected colleges at Purdue were constructed to show the relationships between EExp and NEP among the participants. Correlation analysis was used to find out how each EExp was related to each other and also to NEP. The stronger correlation value between EE and NEP than between EA and NEP relationship indicated that EE had stronger relationship with NEP than EA. Multiple regression was used to determine the significant predictors for NEP. If EAct had a stronger predictor parameter for NEP than the EA's predictor parameter for NEP, this would indicate that EE is a better predictor for NEP than EA. The EE and NEP correlation was strongest in CS than in the other colleges. The EAct to NEP correlation was only significant in CS. The EAct to NEP correlation was significant in all the colleges, with the strongest correlation being in CS. KSB had the only significant correlation for IEA and NEP.

This section is divided into detailed results that show the model construction using correlation and multiple regression analysis for the five selected colleges at Purdue University.

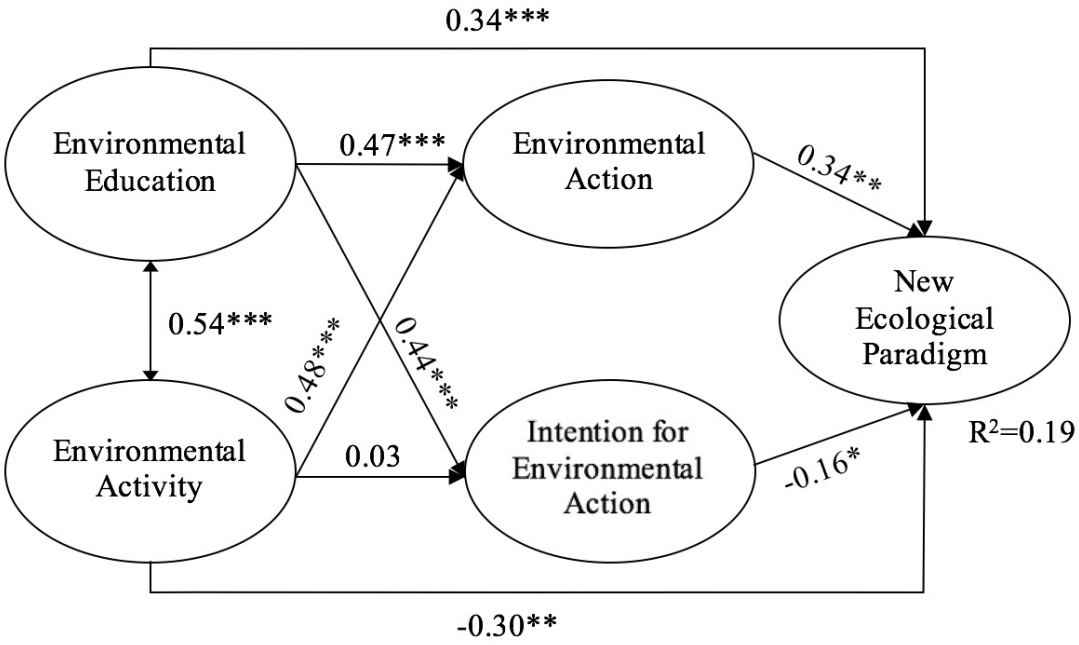


Figure 1 Purdue University undergraduate students' EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.1 Purdue University undergraduate students' EExp and NEP correlations and parameter estimates

All Colleges (N=201)				
	EAct	EA	IEA	NEP
EE	0.544***	0.731***	0.455***	0.349***
EAct	-	0.734***	0.271***	0.089
EA	-	-	0.370***	0.307***
IEA	-	-	-	0.035

Parameter estimates for predicting	NEP ($R^2 = 0.191$)	EA ($R^2 = 0.696$)	IEA ($R^2 = 0.208$)
Variable	β		
EE	0.337***	0.471***	0.437***
EAct	-0.303**	0.478***	0.033
EA	0.344**		
IEA	-0.163*		

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$. β = Standardized regression coefficient estimate.

4.3.1 Purdue University undergraduate students' EExp and NEP relationship in CS

Correlation analysis was used to demonstrate the relationship between EExp and NEP in Purdue University undergraduate students in CS (Table 4.2). In the EExp–NEP correlation among CS students, EE and EA were significantly correlated with NEP: EE–NEP (r = 0.349), and EA–NEP (r = 0.307). EAct and IEA were positively correlated with NEP as well but the correlation was not significant.

Multiple regression analysis was used to demonstrate the EExp predictors for NEP. The CS multiple regression analysis results indicated that EExps were moderately good predictors of NEP (R^2 = 0.44). but the strongest predictor of EExp–NEP was EE–NEP (β = 0.513). EA (β = 0.480) was also significant and a positive predictor of NEP. IEA (β = -0.380) was a significant though negative predictor of NEP. The structural Model Analysis used correlation and multiple regression analysis results to construct the model, which demonstrated the relationship between EExp and NEP for students in CS at Purdue University (Figure 2).

4.3.2 Purdue University undergraduate students' EExp and NEP relationship in CHHS

Correlation analysis and multiple regression analysis were used to demonstrate the relationship between EExp and NEP and to determine the EExp predictor parameter for NEP in CHHS undergraduate students (Table 4.3). CHHS students showed a moderate and significant correlation in EE–NEP (r = 0.330), and EA–NEP (r = 0.327). EAct and IEA were not significant in their correlation with NEP. The strongest relationship between EExp and NEP in CHHS was EA–NEP.

Given the moderate R^2 value ($R^2 = 0.30$), IEA ($\beta = -0.549$) was the only significant though negative predictor for NEP in the EExp–NEP model. The structural Model Analysis used correlation and multiple regression to construct a model for CHHS. The model demonstrated the relationship between EExp and NEP (Figure 3).

4.3.3 Purdue University undergraduate students' EExp and NEP relationship in CLA

The CLA of undergraduate students at Purdue University demonstrated a relationship between EExp and NEP using correlation analysis and also proved to be a good EExp predictor for NEP using multiple regression analysis (Table 4.4). Only EA was significantly though weakly correlated with NEP ($r = 0.259$). Other EExps were weakly and not significantly correlated with NEP. The multiple regression analysis showed low R^2 value ($R^2 = 0.22$). Also, this analysis showed that there was a negative but significant predictor for NEP. EAct was the only significant predictor for NEP ($\beta = -0.515$).

The model construction was done made with Structural Model Analysis, using correlation and multiple regression analysis. The model demonstrated a relationship between EExp and NEP for students in CLA (Figure 4).

4.3.4 Purdue University undergraduate students' EExp and NEP relationship in KSB

A relationship was found for KSB undergraduate students' EExp and NEP relationship was found using correlation analysis (Table 4.5). Among the EExp–NEP correlations in KSB students, EE, EA, and IEA were significantly correlated with NEP: EE–NEP ($r = 0.358$), EA–NEP ($r = 0.480$), and IEA–NEP ($r = 0.384$). EAct was positively correlated with NEP as well though was not significant. The strongest correlation was in the relationship between EA and NEP.

Multiple regression analysis was used to demonstrate EExp predictors for KSB undergraduate students' NEP. KSB multiple regression analysis results indicated that EExps were acceptable predictors for NEP ($R^2 = 0.26$). There was no significant EExp predictor of NEP in KSB undergraduate students. Correlation and multiple regression analysis results were used in the Structural Model Analysis to construct a model. The model demonstrated a relationship between EExp and NEP (Figure 5).

4.3.5 Purdue University undergraduate students' EExp and NEP relationship in CE

Correlation analysis and multiple regression analysis were used to demonstrate the relationship between EExp and NEP and to determine the EExp predictor parameter for NEP in CE undergraduate students (Table 4.6). CE students showed a moderate and significant correlation in EE–NEP ($r = 0.317$), and EA–NEP ($r = 0.297$). EAct and IEA were insignificant in their correlation with NEP. EE had the strongest correlation with NEP in CE undergraduate students.

Given the low R^2 value ($R^2 = 0.19$), none of the EExps were significant predictors for NEP. The model analysis used correlation and multiple regression to construct a model for CHHS. The model demonstrated a relationship between EExp and NEP using correlation and multiple regression analysis (Figure 6).

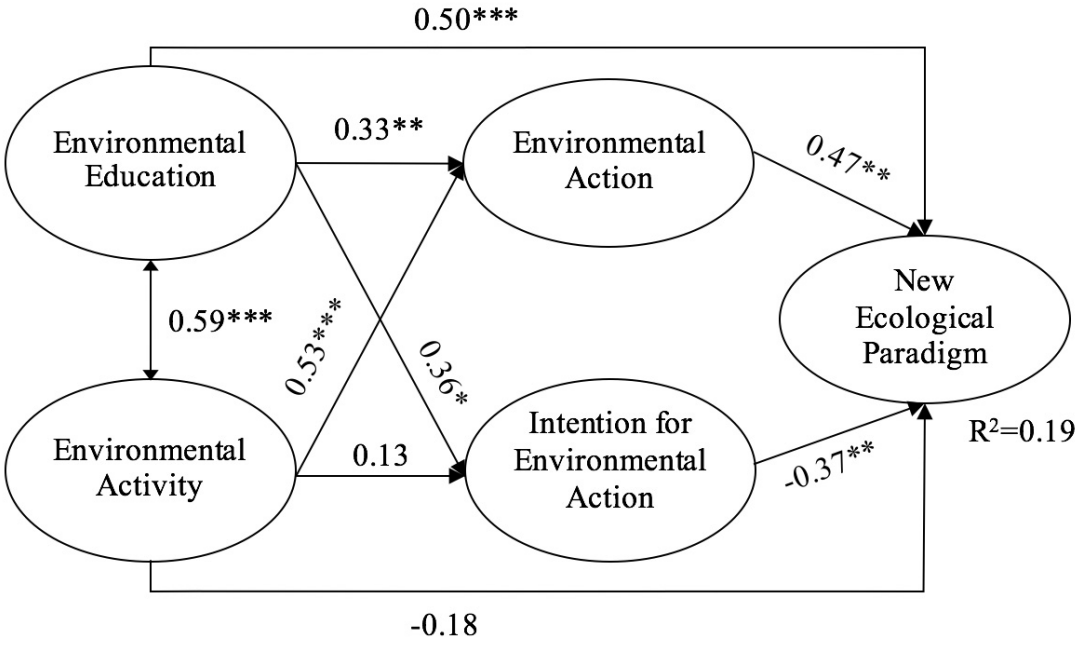


Figure 2 College of Science EExp and NEP model using Structural Model Analysis. *Notes*. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.2 College of Science EExp and NEP correlations and parameter estimates

College of Science (N= 52)				
	EAct	EA	IEA	NEP
EE	0.595***	0.643***	0.441**	0.543***
EAct	-	0.727***	0.345**	0.336**
EA	-	-	0.497***	0.485***
IEA	-	-	-	0.020

Parameter estimate for predicting	NEP ($R^2 = 0.441$)	EA ($R^2 = 0.598$)	IEA ($R^2 = 0.205$)
Variable	β		
EE	0.513**	0.327*	0.364**
EAct	-0.187	0.533***	0.129
EA	0.480**		
IEA	-0.380**		

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

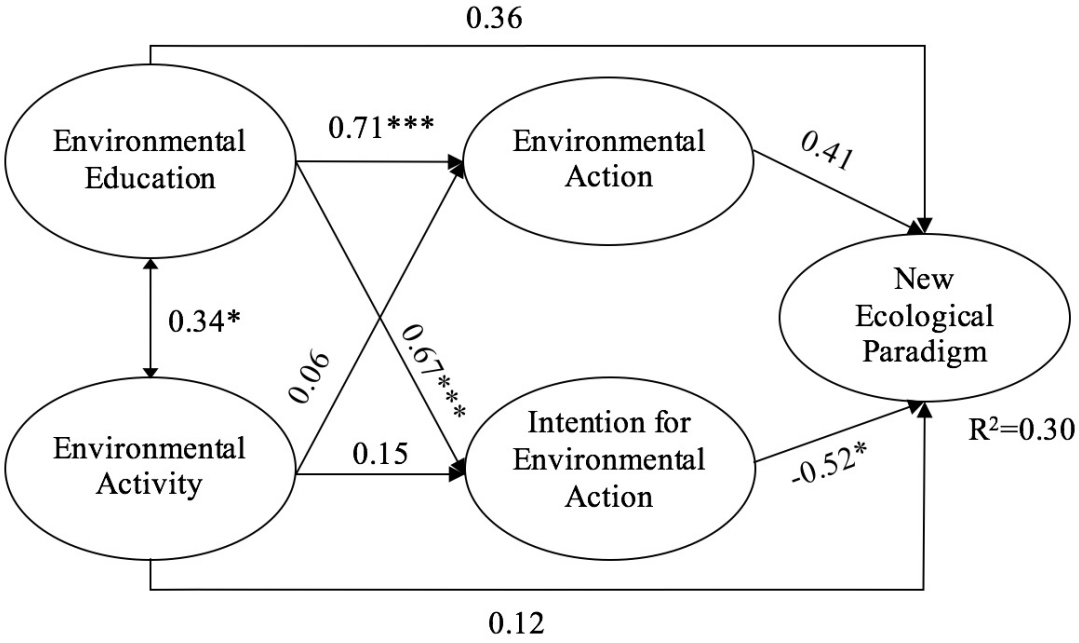


Figure 3 College of Health and Human Sciences EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.3 College of Health and Human Sciences EExp and NEP correlations and parameter estimates

College of Health and Human Sciences (N= 35)				
	EAct	EA	IEA	NEP
EE	0.335*	0.725***	0.726***	0.330*
EAct	-	0.294*	0.380*	0.172
EA	-	-	0.746***	0.327*
IEA	-	-	-	0.091

Parameter estimates for predicting	NEP ($R^2 = 0.236$)	EA ($R^2 = 0.529$)	IEA ($R^2 = 0.548$)
Variable	β		
EE	0.376	0.706***	0.674***
EAct	0.130	0.057	0.154
EA	0.426	-	-
IEA	-0.549*	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

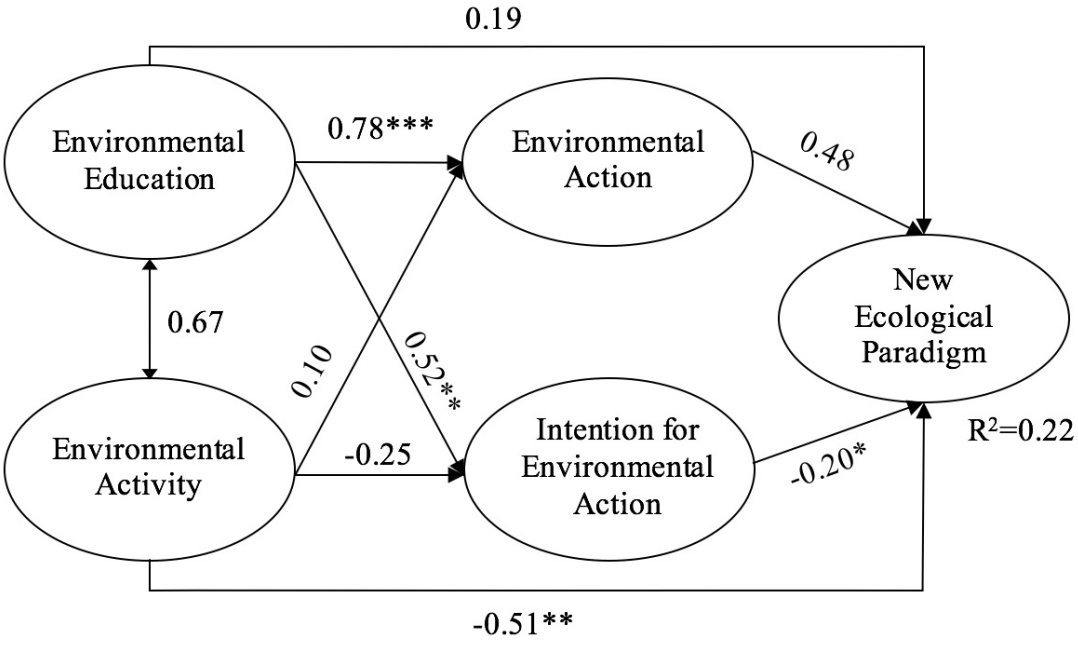


Figure 4 College of Liberal Arts EExp and NEP model using Structural Model Analysis. *Notes*. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.4 College of Liberal Arts EExp and NEP correlations and parameter estimates

College of Liberal Arts (N= 45)				
	EAct	EA	IEA	NEP
EE	0.673***	0.849***	0.349**	0.189
EAct	-	0.629***	0.099	-0.100
EA	-	-	0.330*	0.259*
IEA	-	-	-	-0.023

Parameter Estimates for predicting	NEP ($R^2 = 0.218$)	EA ($R^2 = 0.728$)	IEA ($R^2 = 0.156$)
Variable	β		
EE	0.196	0.779**	0.517**
EAct	-0.515**	0.104	-0.249
EA	0.482	-	-
IEA	-0.199	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

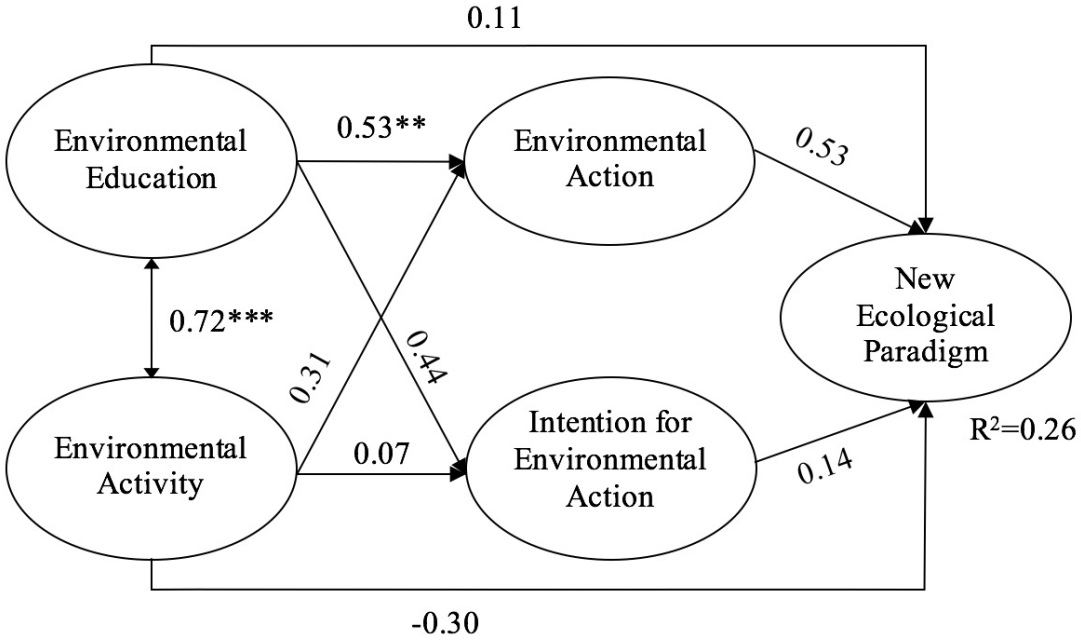


Figure 5 Krannert School of Business EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.5 Krannert School of Business EExp and NEP correlations and parameter estimates

Krannert School of Business (N= 25)				
	EAct	EA	IEA	NEP
EE	0.722***	0.756***	0.491*	0.358*
EAct	-	0.696***	0.390**	0.201
EA	-	-	0.598*	0.480**
IEA	-	-	-	0.384*

Parameter Estimates for predicting	NEP ($R^2 = 0.281$)	EA ($R^2 = 0.619$)	IEA ($R^2 = 0.244$)
Variable	β		
EE	0.111	0.530**	0.438
EAct	-0.292	0.313	0.074
EA	0.519	-	-
IEA	0.134	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

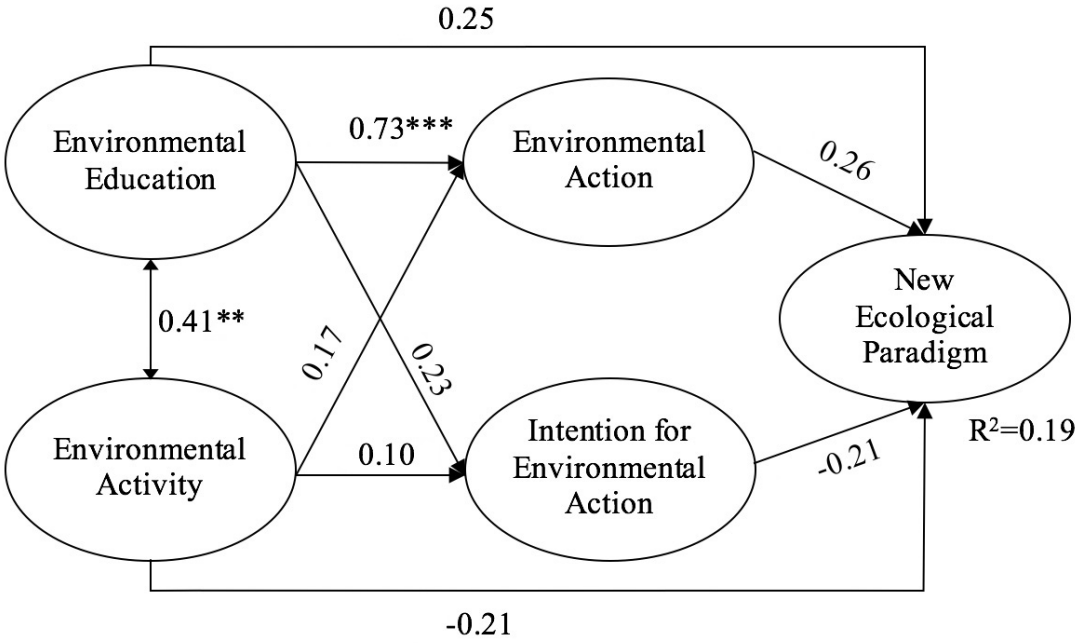


Figure 6 College of Engineering EExp and NEP model using Structural Model Analysis. *Notes*. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.6 College of Engineering EExp and NEP correlations and parameter estimates

College of Engineering (N= 44)				
	EAct	EA	IEA	NEP
EE	0.410**	0.798***	0.268*	0.317*
EAct	-	0.470**	0.192	-0.024
EA	-	-	0.307*	0.297*
IEA	-	-	-	-0.107

Parameter Estimates for predicting	NEP ($R^2 = 0.185$)	EA ($R^2 = 0.662$)	IEA ($R^2 = 0.080$)
Variable	β		
EE	0.254	0.728***	0.227
EAct	-0.208	0.172	0.099
EA	0.257	-	-
IEA	-0.214	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

4.4 Results for sub-question 2: Purdue University undergraduate students from Indiana non-Indiana states and international students EExp and NEP relationship

Not many correlations for Indiana, non-Indiana, and international students at Purdue University were significant. The EE and NEP correlation was significant in all three groups of students. The EA and NEP correlation were significant only in Indiana (r = 0.244) (Table 4.7) and non-Indiana students (r = 0.547) (Table 4.8). IEA and NEP correlation was significant only in Indiana (r = -0.672) (Table 4.9).

This section is divided up to show the detailed correlation and multiple regression analysis used to construct a model for Purdue University undergraduate students from Indiana, students from non-Indiana states, and international students.

4.4.1 Purdue University undergraduate students from Indiana EExp and NEP relationship

A model was constructed for Purdue University undergraduate students from Indiana, using correlation analysis and multiple regression analysis to determine the relationship between EExp and NEP (Table 4.7). Given the low R^2 value, EExps were not a strong predictor NEP in Purdue University undergraduate students from Indiana (R^2 = 0.16). Correlation analysis was used to find the relationship between the EExp and NEP. Among EExp–NEP correlations, two EExps, EE (r = 0.199) and EA (r = 0.244) were moderately and significantly correlated with NEP (Table 4.7). EAct and IEA were positively but not significantly correlated with NEP. EA had a stronger correlation with NEP than EE.

Multiple regression analysis was used to determine EExp predictors for NEP. The strongest predictor for EExp in the EExp–NEP model was EA (β = 0.412). EAct (β = -0.329) was a moderate and significant though negative predictor for NEP. EE (β = 0.150),

and IEA (β = -0.160) were insignificant predictors for NEP (Table 4.7). Correlation and multiple regression analysis results were used in AMOS to construct a model which demonstrated the relationship between EExps and NEP for Indiana students at Purdue University (Figure 7).

4.4.2 Purdue University undergraduate students from non-Indiana states EExp and NEP relationship

A model for Purdue University undergraduate students from non-Indiana states used correlation analysis and multiple regression analysis to determine their relationship between the EExp and NEP (Table 4.8). Correlation analysis was used to demonstrate relationship between EExp and NEP for Purdue University undergraduate students from non-Indiana states (Table 4.2). In the EExp–NEP correlation among non-Indiana students, EE, EAct, and EA were significantly correlated with NEP: EE–NEP (r = 0.575), EAct–NEP (r = 0.345), and EA–NEP (r = 0.547). IEA was also positively correlated with NEP but was not significant.

Multiple regression analysis was used to demonstrate the EExp predictors of NEP. The multiple regression analysis for the non-Indiana students indicated that EExps were moderately moderate predictors for NEP (R^2 = 0.39). However, there was only one significant predictor for NEP in non-Indiana students, which was EE–NEP (β = 0.444). The Structural Model Analysis used the correlation and multiple regression analysis results to construct a model which demonstrated the relationship between EExp and NEP for Purdue University undergraduate students from non-Indiana states (Figure 8).

4.4.3 Purdue University international undergraduate students EExp and NEP relationship

Correlation analysis and multiple regression analysis were used to demonstrate the relationship between EExp and NEP and to determine EExp predictor parameter for NEP international undergraduate students (Table 4.9). International students had moderate and significant correlation in EE–NEP (r = 0.049), and IEA–NEP (r = -0.672). EAct and EA were insignificant in their correlation with NEP. Strongest relationship between EExp and NEP was in IEA and NEP, though it was negative correlation.

Given the moderately higher R^2 value than other demographic variables (R^2 = 0.56), IEA (β = -0.718) was the only significant but negative predictor for NEP in the EExp–NEP model. Purdue University international undergraduate students' model was constructed using Structural Model Analysis with correlation and multiple. The model demonstrated the relationship between EExp and NEP (figure 9).

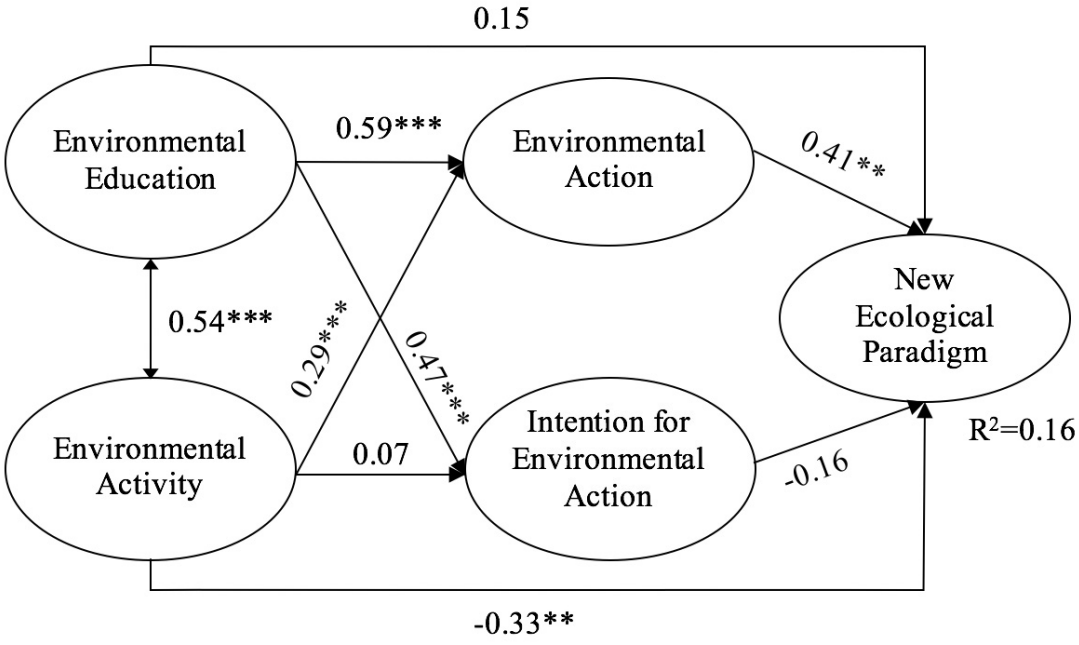


Figure 7 Purdue University undergraduate students from Indiana EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.7 Purdue University undergraduate students from Indiana EExp and NEP correlations and parameter estimates

Indiana (N= 121)				
	EAct	EA	IEA	NEP
EE	0.540***	0.743***	0.504***	0.199*
EAct	-	0.606***	0.320***	-0.049
EA	-	-	0.508***	0.244**
IEA	-	-	-	0.020

Parameter Estimates for predicting	NEP ($R^2 = 0.143$)	EA ($R^2 = 0.612$)	IEA ($R^2 = 0.257$)
Variable	β	β	β
EE	0.150	0.587***	0.467***
EAct	-0.329**	0.289**	0.068
EA	0.412**	-	-
IEA	-0.160	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

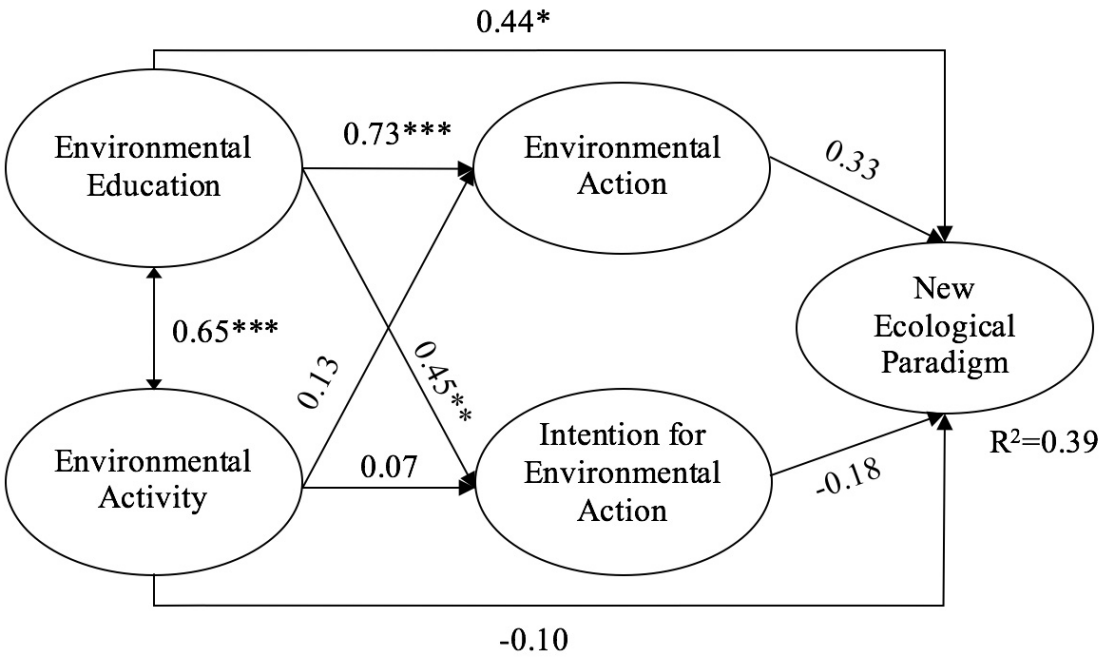


Figure 8 Purdue University undergraduate students from non-Indiana states EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.8 Purdue University undergraduate students from non-Indiana states EExp and NEP correlations and parameter estimates

Non-Indiana (N= 121)				
	EAct	EA	IEA	NEP
EE	0.647***	0.816**	0.407***	0.575***
EAct	-	0.600***	0.226*	0.345**
EA	-	-	0.470***	0.547***
IEA	-	-	-	0.131
Parameter Estimates for predicting	NEP ($R^2 = 0.378$)	EA ($R^2 = 0.674$)	IEA ($R^2 = 0.168$)	
Variable	β			
EE	0.444*	0.735***	0.449**	
EAct	-0.100	0.125	-0.064	
EA	0.331	-	-	
IEA	-0.183	-	-	

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

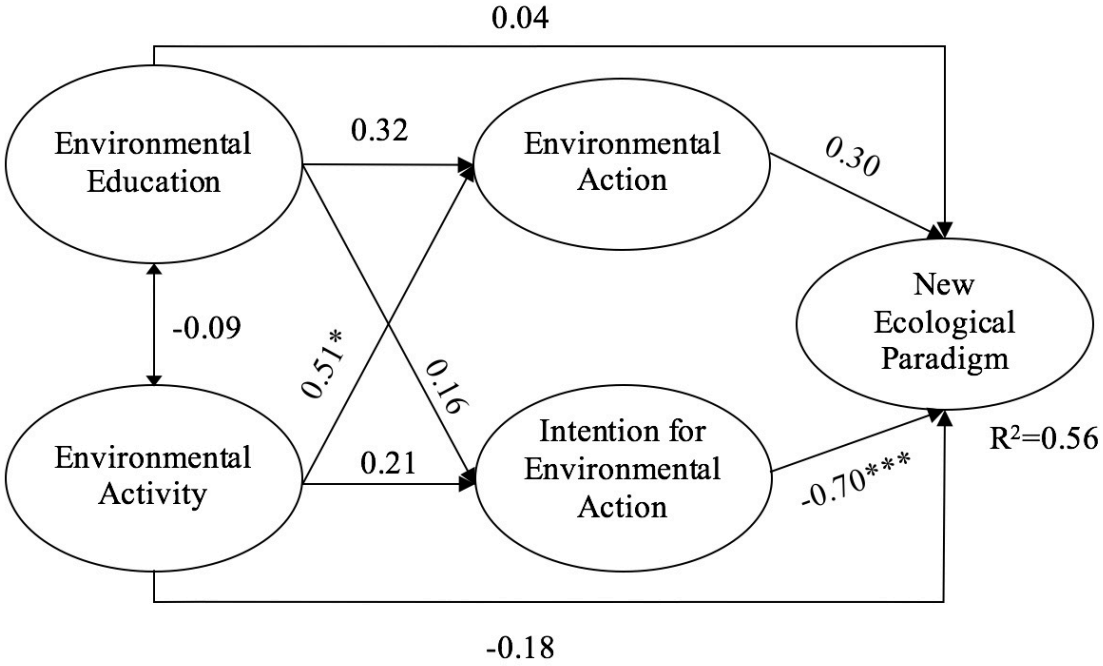


Figure 9 Purdue University international undergraduate students EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.9 Purdue University international undergraduate students EExp and NEP correlations and parameter estimates

International (N= 14)				
	EAct	EA	IEA	NEP
EE	-0.094	0.276	0.137	0.049*
EAct	-	0.482*	0.193	-0.176
EA	-	-	0.240	0.063
IEA	-	-	-	-0.672***

Parameter Estimates for predicting	NEP ($R^2 = 0.536$)	EA ($R^2 = 0.336$)	IEA ($R^2 = 0.061$)
Variable	β		
EE	0.044	0.324	0.157
EAct	-0.184	0.512	0.207
EA	0.311	-	-
IEA	-0.718*	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological

4.5 Results for sub-question 3: Purdue University male and female undergraduate students EExp and NEP relationship

The structural model in Figures 10 and 11 shows the path from EExp to NEP that used correlation analysis and multiple regression analysis.

The significant correlation for male and female students were shown in between EE and NEP as well as EA and NEP. Female students had stronger correlation for both relationships than male students. The correlation between EE and NEP was significant in both male and female students. Male students also showed a weak but significant correlation. Female students showed strong and significant correlation. The EA and NEP showed positive correlation in both male and female students. But only female students' path from EAct to NEP was significant. The correlation between IEA and NEP was not significant both genders.

This section is divided up to show male and female students' detailed correlation and multiple regression analysis, which were used to construct the model for Purdue University undergraduate students.

4.5.1 Purdue University male undergraduate students EExp and NEP relationship

Correlation was used to determine the relationship between EExp and NEP in Purdue male undergraduate students. Multiple regression analysis was used to determine the predictor parameter in EExps for NEP (Table 4.10). The EE and EA were significantly correlated with NEP: EE–NEP (r = 0.233), and EA–NEP (r = 0.228). The EE had slightly stronger correlation with NEP. EAct and IEA were negatively and not significantly correlated with NEP. Using multiple regression analysis, EExp and NEP for male students showed a low

R^2 value (R^2=0.15). The EA (β = 0.279) was a positive and significant predictors for NEP. EAct (β = -0.318) was stronger significant predictor for NEP than EA though it was negative. Model construction was done using Structural Model Analysis with correlation and multiple regression. The model demonstrated the relationship between EExp and NEP (Figure 10).

4.5.2 Purdue University female undergraduate students EExp and NEP relationship

Correlation analysis and multiple regression were used to determine the relationship between EExp and NEP for female undergraduate students at Purdue University (Table 4.11). There were positive and significant correlations in two EExps and in NEP female undergraduate students at Purdue University, EE–NEP (r = 0.514), EAct–NEP (r = 0.210), and EA–NEP (r = 0.470). EE showed the strongest correlation with NEP than the other EExps. IEA was not significant in its correlation with NEP.

Although the results from the multiple regression analysis for female undergraduate students at Purdue University indicated a moderate R^2 value (R^2=0.34), three EExps were significant predictors of NEP. Among the EExps, the strongest predictor of NEP was EE (β = 0.455). EA (β = 0.348) and IEA (β = -0.260) were also significant predictors of NEP. EAct was not a significant predictor of NEP. The Structural Model Analysis used correlation and multiple regression to construct a model for CHHS. This model demonstrated the relationship between EExp and NEP (Figure 11).

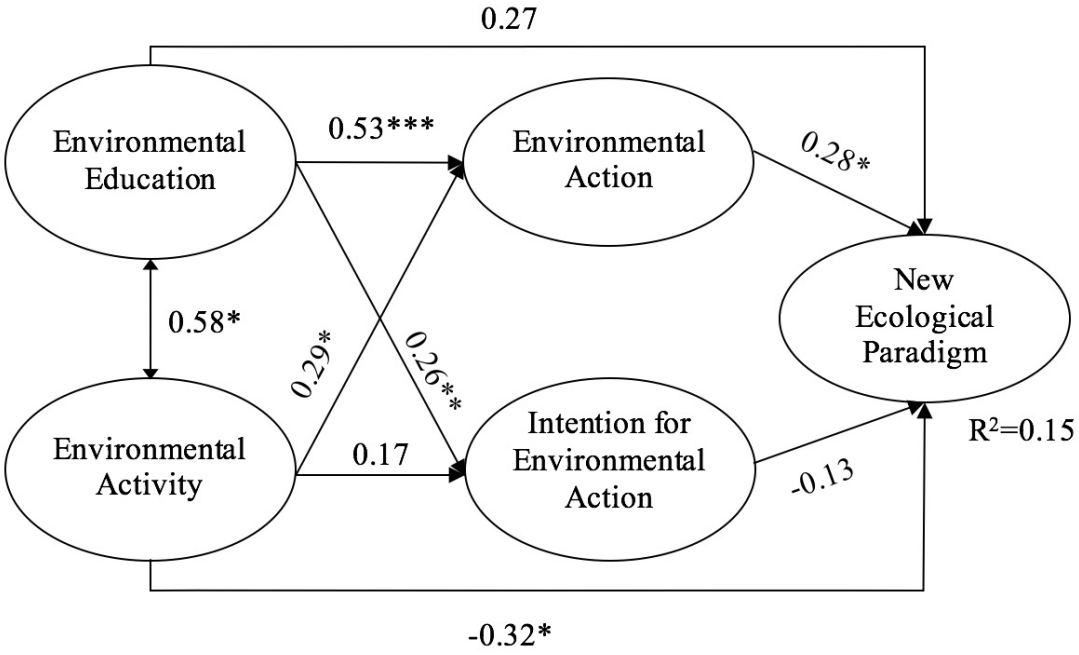


Figure 10 Purdue University male undergraduate students EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.10 Purdue University male undergraduate students EExp and NEP correlations and parameter estimates

Male (N= 98)				
	EAct	EA	IEA	NEP
EE	0.577***	0.705***	0.362***	0.233*
EAct	-	0.603***	0.323**	-0.038
EA	-	-	0.364***	0.228*
IEA	-	-	-	-0.034

Parameter Estimates for predicting	NEP ($R^2 = 0.142$)	EA ($R^2 = 0.554$)	IEA ($R^2 = 0.150$)
Variable	β		
EE	0.267	0.535***	0.262**
EAct	-0.318*	0.295*	0.172
EA	0.279*	-	-
IEA	-0.129	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

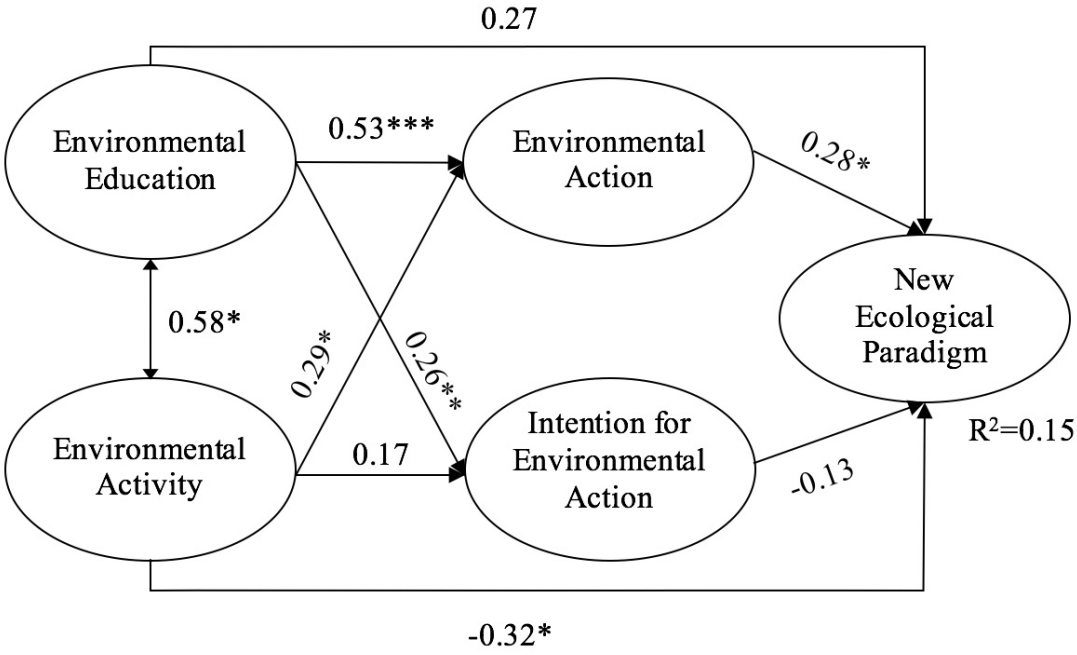


Figure 11 Purdue University female undergraduate students EExp and NEP model using Structural Model Analysis.
Notes. *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

Table 4.11 Purdue University female undergraduate students EExp and NEP correlations and parameter estimates

Female (N= 103)				
	EAct	EA	IEA	NEP
EE	0.517***	0.819***	0.549***	0.514***
EAct	-	0.587***	0.266**	0.210*
EA	-	-	0.602***	0.470***
IEA	-	-	-	0.157

Parameter Estimates for predicting	NEP ($R^2 = 0.323$)	EA ($R^2 = 0.707$)	IEA ($R^2 = 0.302$)
Variable	β		
EE	0.455**	0.703***	0.562***
EAct	-0.161	0.224***	-0.025
EA	0.348*	-	-
IEA	-0.260**	-	-

Notes. EE = Environmental Education, EAct =Environmental Activity, EA = Environmental Action, IEA = Intended Environmental Action, NEP = New Ecological Paradigm *Significant at $p<0.05$. **Significant at $p<0.001$. ***Significant at $p<0.0001$.

5 CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS

5.1 Introduction

After the United Nations drew global attention to EE in recognition of the world's environmental concerns, many scholars and researchers have sought methods to promote pro-environmental behaviors in students, who are future decision makers. To promote pro-environmental behaviors, they have looked at motivations, environmental attitude, paradigm, and different types of EE. About 40 years have passed since attention has been paid to this issue, but the current global environmental situation has shown no improvement. Rather, there are now more serious environmental issues including the plastic islands in Pacific Ocean that cause death in fish populations, the smog that causes respiratory health issues, and the chemicals that lead to pollution in water systems. In order to promote pro-environmental behavior, it was necessary to understand the population's current environmental paradigm. This study aimed to identify the relationship between EExps and NEP among Purdue University undergraduate students. EExp variables, that is EE, EAct, EA, and IEA along with NEP were gathered by survey using Qualtrics. Correlation analysis, multiple regression analysis, and path analysis were used to create models that display the relationship between EExps and NEP. The conclusions on the main research question and the three sub-research questions, the implications and the recommendations for the study are included in this chapter.

5.2 Purpose of the Study

The main purpose of the study was to examine the relationship between EExp and NEP in Purdue University undergraduate students. This study examined this relationship by surveying students from five colleges at the university by educational background, by geography (Indiana, non-Indiana, and international) and by gender.

5.3 Conclusions to Research Question 1

Research Question 1: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate students?

Hypothesis 1: There is a stronger correlation between environmental activity and NEP than other environmental experiences for Purdue University undergraduate students. Correlation analysis was used with Purdue University undergraduate students to determine the relationship between EExp and NEP. The results indicated that EE and EA had significant correlation with NEP. EAct and IEA were not significantly correlated with NEP. With higher EE and higher EA, students would have more pro-environmental orientation. The EE may have the strongest correlation with NEP than EA because participants were all students who have been receiving education. Although EA has been promoted to students, it may not be the strongest factor for their environmental orientation. The multiple regression analysis showed that all EExp variables could be used to predict NEP. The EAct and NEP relationship was found to be not significant and also weak, while EE had the strongest correlation with NEP among the EExps. This contradicted the

hypothesis that EAct would have the highest correlation with NEP and indicated that even if students had the same amount of EE as EA, students would be likely to have more pro-environmental orientation because of EE than EA.

5.3.1 Conclusions to Research Sub-Question 1

Research sub-question 1: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate students in five colleges?

Sub-question hypothesis 1: There is a stronger correlation between environmental experiences and NEP in science related colleges than in non-science related colleges.

The instrument used to find the relationship between EExp and NEP, correlation analysis, indicated that there was a significant correlation between EE and NEP and between EA and NEP in almost all colleges. The EE and NEP relationship was not significant in CLA. The EAct and NEP relationship was only significant in CS, and the IEA to NEP relationship was only significant in KSB.

CS showed the strongest correlation between EE and NEP. This demonstrated that with more EE, students were more likely to have pro-environmental orientation. The weakest correlation was in CLA, while the strongest EA to NEP was in CS. Since EAct was only significant in CS, it is difficult to come to a conclusion on stronger EAct to NEP relationship for the five colleges. IEA was similar to EAct in that it was only significant in KSB in the EExp and NEP correlation. Rationale behind strongest correlation between EE and NEP in CS may be that CS requires students to take science courses. Science courses

may have caused students to think about living organisms, their surroundings, and cause-and-effect relationship for their actions. CLA, as non-science related college, may have not required students to take science courses. Students in CLA may have taken courses related to internal relationships among humanity.

However, interestingly, although the strongest correlation between EExp and NEP was in CS and the weakest in CLA, results partially supported the hypothesis. CHHS was selected as a science related college and KSB was selected as a non-science related college. However, CHHS had a weaker correlation than KSB in the EE to NEP relationship as well as the EA and NEP relationship. This may be that although CHHS is a college related to science, students in CHHS may have taken courses related more to health rather than nature. KSB, although it is a non-science college, may have stronger correlation between EExp and NEP because they think about economic benefits. Learning requires money and it might drive them to learn more from EE. CE also had a significant moderate correlation between EE and NEP and EA and NEP relationship, which were lower than CS but higher than CLA. CE students may be technocentric students, who believe that "technological innovations can solve problems" (Thapa, 2010, 143). According to Thapa (2010), technocentric students have lower environmental orientation than non-technocentric students with the same amount of EE. Therefore, CE students having lower correlation between EExp and NEP aligns with past literatures.

According to Greenfield, Kuhn, and Wojtys (1998), correlation analysis and multiple regression analysis are different. Correlation analysis shows the relationship between two variables while multiple regression analysis shows the causal effect, meaning that β would be used to predict the dependent variable. The results in multiple regression analysis

demonstrated that EE and EA in CS were the only significant predictors of NEP. Thus, a higher EE value in CS could have been used to predict NEP.

5.3.2 Conclusions to Research Sub-Question 2

Research sub-question 2: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate students from Indiana, non-Indiana and international students?

Sub-question hypothesis 2: There is a stronger positive correlation between environmental experiences and NEP in Purdue University undergraduate students from non-Indiana states than students from Indiana.

The results for the sub-research question regarding students' educational background by geography indicated that non-Indiana students showed a higher correlation between EExp and NEP than did Indiana students. The results for international students did not show much significance to come to a reasonable conclusion on the EExp and NEP relationship. The EE and NEP, EAct and NEP, and EA and NEP relationships were stronger in non-Indiana students than Indiana students. EE and EA showed a strong correlation with NEP in non-Indiana students while EE showed a weak correlation with NEP in Indiana students. This result demonstrates that non-Indiana students would have a more pro-environmentally orientation with the same amount of EE and EA than Indiana students. IEA was only significantly correlated with NEP in international students. This relationship was negative, indicating that with higher IEA, students would have a less pro-environmental orientation. Stronger correlation between EE and NEP, EAct and NEP, as well as EA and NEP in non-

Indiana students show that there may EE, EAct and EA done in states other than Indiana are more effective on students than Indiana.

The multiple regression analysis indicated that EE was a significant predictor of NEP in non-Indiana students only. Significant predictor variable could be used to determine NEP because this would indicate a causal factor for the dependent variables. Since EE has a strong correlation with NEP and is also a significant predictor of NEP, EE could be used determine NEP. EA and EAct were found to significant predictors in Indiana students only. And IEA was a significant predictor in international students.

5.3.3 Conclusions to Research Sub-Question 3:

Research sub-question 3: What is the relationship between environmental experiences (environmental education, environmental activity, environmental action, and intended environmental action) and NEP (New Ecological Paradigm) in Purdue University undergraduate male and female students?

Sub-question hypothesis 3: There is a stronger correlation between environmental experiences and NEP in Purdue University undergraduate female students than in male students.

Correlation analysis results for Purdue University undergraduate students' relationship between EExp and NEP indicated that EE and NEP as well as EA and NEP relationships were significantly correlated for both genders. EAct and NEP was only significantly correlated in female students while IEA had and insignificant correlation with NEP. Insignificant correlations were not used to make conclusions about a comparison for stronger correlations in the two groups of students.

Both EE and NEP as well as EA and NEP relationships were stronger in female students than in male students. Female students showed a strong correlation while male students showed a moderate EE to NEP correlation. Female students showed a moderate correlation between EA and NEP, while male students showed a weak correlation between EA and NEP. This result aligns with past literatures showing that female students have stronger correlation in EExp and NEP. Female students may be more concerned with environment than male students.

Multiple regression analysis demonstrated that EA was a significant predictor of NEP in both genders. This demonstrates that with more EA, students would have more pro-environmental orientation and that EA could be used to predict students' NEP. EAct was also a significant predictor for NEP male students along with EE and IEA. The significant predictor, EExp, could be used to determine both male and female Purdue University undergraduate students' environmental orientation.

Since EAct and IEA EExp were insignificant in both genders, the results partially supported the hypothesis that female students showed a stronger correlation between EExp and NEP. Female students showed a stronger correlation between EE and NEP as well as EA and NEP.

5.4 Implications for Practice

This study's implications for practice focus on controversial topics on EE and environmental orientation. Previous researches have indicated that EE had not only positive but also no significant influence on environmental orientation. The present study indicates that EE showed the strongest relationship with environmental orientation than

with any other EExps for all the student participants at Purdue University. EA also showed a strong relationship with environmental orientation. Therefore, placing more emphasis on EA for students could enhance students' environmental orientation.

The relationships between EE and NEP as well as EA and NEP were significantly different between Indiana and non-Indiana students. Non-Indiana students showed a stronger relationship with both EExps and with environmental orientation (NEP). Changes are needed in EE that allow students to have more opportunities to learn about the environment and to perform pro-environmental actions.

Overall, to assist teachers in improving students' environmental orientation, teachers should also be given more opportunities to learn more about environment so that they can improve the EE offered to students in class.

5.5 Recommendations for Future Research

This study revealed that EExp has a variety of relationships with NEP in Purdue University undergraduate students. EE and EA were two major EExps that showed a significant correlation with NEP. EAct and IEA did not show a significant correlation with NEP for student participants at Purdue University. Following statements are recommendations for future research consideration.

1. The results from this study indicate that female students as opposed to male students, CS among the five colleges, and students from states other than Indiana among student groups with different education backgrounds, showed a stronger correlation with EExp and NEP than the other students. Environmental behaviors and attitude were not examined in this study. Therefore, future researches should find out

whether there is a strong correlation between EExp and environmental behaviors and attitudes.

2. This study distinguished Purdue University students by educational background by Indiana, non-Indiana, and international. Non-Indiana students and international students acknowledged specific regions. However, there were too few students to represent each region. Therefore, a future study could select universities in other states or countries to determine the relationship between EExp and NEP.
3. There were significant differences between Indiana and non-Indiana students' EExps and NEP relationships. This study indicates that Indiana students showed less EExp and NEP correlation than students from other states in the U.S. Future research could conduct a study on possible differences in environmental behavior and could also determine the rationale behind the differences in EExp and NEP relationships.
4. Contradicting studies that have indicated a positive correlation between EAct and NEP, this study revealed that Indiana students, students in all four of the selected colleges, and both genders showed a weaker correlation with NEP than with EE or EA. Future studies could determine how EAct could be changed to promote greater pro-environmental orientation.

REFERENCES

REFERENCES

Anderson, M. W., Teisl, M. F., & Criner, G. K. (2007). Attitude changes of undergraduate university students in general education courses. *Journal of General Education*, *56*, 149–168.

Arcury, T.A., Johnson, T.P. & Scollay, S.J. (1986). Ecological worldview and environmental knowledge: The 'new envi- ronmental paradigm'. *Journal of Environemtnal Education,* 17(4), 35-40.

Arnocky, S., Stroink, M.L. (2011). Variation in environmentalism among university students: majoring in outdoor recreation, parks, and tourism predicts environmental concerns and behaviors. *The Journal of Environmental Education,* 42(3), 137-151.

Arendt, F., & Matthes, J. (2014). Nature documentaries, connectedness to nature, and pro-environmental behavior. *Environmental communication,* 10(4), 453-372.

Ballantyne, R., Packer, J., & Sutherland, L.A. (2011) Visitor's memories of wildlife tourism: Implications for the design of powerful interpretive experiences. *Tourism Management*, 32, 770-779.

Bergman, B.G. (2015). Assessing impacts of locally designed environmental education projects on students' environmental attitudes, awareness, and intention to act. *Environmental Education Research,* 22(4), 480-503.

Bjerke, T., Thrane, C., & Kleiven, J. (2007). Outdoor recreation interests and environmental attitudes in Norway. *Managing Leisure,* 11, 116-128.

Bogner, F. X. (1998). The influence of outdoor ecology education on long-term variables of environmental perspective. *Journal of Environmental Education*, *29*(4), 17–29.

Bogner, Franz X., & Manfred G. Wilhelm. (1996). Environmental perspectives of pupils: The development of an attitude and behavior scale. *The Environmentalist*, 16(2), 95–110.

Boo, S., & Park, E. (2012). An examination of green intention: the effect of environmental knowledge and educational experiences on meeting planners' implementation of green meeting practices. *Journal of Sustainable Tourism.* 21(8), 1129-1147.

Brown, F. (2009). Key terms in environmental fields: establishing a foundation. *Green Teacher,* 87, 27-29.

Casey, P.J., & Scott, K. (2006). Environmental concern and behavior in Australian sample within an ecocentric-anthropocentric framework. *Australian Journal of Psychology,* 58(2), 57-67.

Carida, H.C. (2011). Primary pupils' consumer habits and behaviors in the purchase and management of products and services: The case of Greece. *Journal of Human Behavior in the Social Environment,* 21(2), 142-161.

Collado, S., & Corraliza, J.A. (2015). Children's restorative experiences and self-reported environmental behaviors. *Environment and Behavior*. 47(1), 38-56.

Dancer, D., & Tremayne, A. (2006). R-squared and prediction in regression with ordered quantitative response. *Journal of Applied Statistics,* 32(5), 483-493.

De Young, R. (1990). Recycling as appropriate behavior: A review of survey data from selected recycling education programs in Michigan. *Conservation and Recycling*, 3(2), 253-266.

Derhab, A., Bouras, A. (2014). Multivariabe correlation analysis and geometric linear similarity for real-time intrusion detection systems. *Security and Communication Networks,* 8, 1193-1212.

Duerden, M.D., & Witt, P.A. (2010). The impact of direct and indirect experiences on the development of environmental knowledge, attitudes and behavior. *Journal of Environmental Psychology*, 30, 379-392.

Dunlap, R.E., & Hefferman, R.B. (1975). Outdoor Recreation and Environmental Concern: An Empirical Examination. Rural Sociology, 40(1), 18-30.

Dunlap, R. E., & Van Liere, K. D. (1978). A proposed measuring instrument and preliminary results: The new environ-mental paradigm. *Journal of Environmental Education*, 9, 10–19.

Dunlap, R.E., Van Liere, K.D., Mertig, A.G., & Jones, R.E. (2000a). Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues*, 56(3), 425-442.

Dunlap, R., Van Liere, K., Mertig, A., & Jones, R. (2000b). New trends in measuring environmental attitudes: Measuring endorsement of the New Ecological Paradigm: A revised NEP Scale. *Journal of Social Issues*, 56(3), 425–442.

Dvorak, B.I., Stewart, B.A., Hosni, A.A., Hawkey, S.A., & Nelsen, V. (2011). Entensitve environmental sustainability education: Long-term impacts on workplace behavior. *Journal of Professional Issues in Engineering Education and Practice,* 137(2), 113-121.

Ferreira, S. (2012, April). Moulding urban children toward environmental stewardship: the table mountain national park experience, *Environmental Education Research*, 18(2), 251-270.

Fielding, K.S., & Head, B.W. (2011). Determinants of young Australians' environmental actions: the role of responsibility attributions, locus of control, knowledge and attitudes. *Environmental Education Research.* 18(2), 171-186.

Frohlich, G., Sellmann, D., & Bogner, F.X. (2013). The influence of situational emotions on the intention for sustainable consumer behavior in a student-centered intervention. *Environmental Education Research,* 19(6), 747-764.

Fryxell, G.E., & Lo, C.W.H. (2003). The influence of environmental knowledge and values on managerial behaviors on behalf of the environment: an empirical examination of managers in China. *Journal of Business Ethics*. 46(1), 45-69.

Gosling, E., Williams, K.J.H. (2010). Connectedness to nature, place attachment and conservation behavior: testing connectedness theory among farmers. *Journal of Environmental Psychology,* 30, 298-304.

Greenfield, M.L.V.H., Kuhm, J.E., & Wojtys, E.M. (1998). A statistics primer: Correlation and regression analysis. *The American Journal of Sports Medicine,* 25(2), 338-343.

Hadjichambis, A.C., Paraskeva-Hadjichambi, D., Ioannou, H., Georgiou, Y., & Manoli, C.C. (2015). Integrating sustainable consumption into environmental education: a case study on environmental representations, decision making, and intention to act. *International Journal of Environmental & Science Education,* 10(1), 67-86.

Halpenny, E.A. (2010). Pro-Environmental behaviours and park visitors: the effect of place attachment. *Journal of Environmental Psychology*. 30, 409-421.

Harraway, J., Broughton-Ansin, F., Deaker, L., Jowett, T., & Shepard, K. (2012). Exploring the use of the Revised New Ecological Paradigm Scale (NEP) to monitor the development of students' ecological worldviews, *The Journal of Environmental Education*, 43(3), 177-191.

Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the past 30 years: A meta-analysis. *Journal of Environmental Psychology*, 30, 143–158.

Higher Education in Europe. (1979). Declaraiton of Tbilisi Inergovernmental Conference on Environmental Education, 4:1, 5-8.

Hines, J, Hungerford, H., Tomera, A. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education,* 18(2), 1-8.

Hovardas, T., & Korfiatis, K. (2012). Effects of an environmental education course on consensus estimates for proenvironmental intentions. *Environment and Behavior,* 44(6), 860-784.

Johnson, C.Y., Bowker, J.M., & Cordell, H.K. (2004). Ethnic Variation in Environmental Belief and Behavior: An Examination of the New Ecological Paradigm in a Social Psychological Context. *Environment and Behavior*, 36(2), 157-186.

Kafyri, A., Hovardas, T., & Poirazidis, K. (2012). Determinants of visitor pro-environmental intentions on two small greek islands: Is ecotourism possible at coastal protected areas? *Environmental Management,* 50, 64-76.

Kaiser, F.G., Wolfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behavior. *Journal of Environmental Psychology*, 19(1), 1-19.

Kinsey, T. G., & Wheatley, J. H. (1980). An instrument to inventory the defensibility of environmental attitudes. *The Journal of Environmental Education, 12*(1), 29-35.

Kuo, S., & Jackson, N.L. (2014). Influence of an environmental studies course on attitudes of undergraduates at an engineering university. *The Journal of Environmental Education,* 45(2), 91-104.

Lee, T.H., & Jan, F.H. (2015). The influence of recreation experience and environmental attitude on the environmental responsible behavior of community-based tourists in Taiwan. *Journal of Sustainable Tourism,* 23(7), 1063-1094.

Lee, S., & Paik, H.S. (2010). Korean Household Waste Management and Recycling Behavior. *Building and Environment*, 46, 1159-1166.

Meyer, A. (2015). Does education increase pro-environmental behavior? Evidence from Europe. *Ecological Economics*, 116, 108-121.

Mobley, C., Vagias, W.M., & DeWard, S.L. (2010). Exploring Additional Determinants of Environmentally Responsible Behavior: The Influence of Environmental Literature and Environmental Attitudes. *Environment and Behavior*, 42(4), 420-447.

Nooney J.G., Woodrum, E, Hoban, T.J., & Clifford, W.B. (2003). Environmental Worldview and Behavior: Consequences of Dimensionality in a Survey of North Carolinians. *Environment and Behavior*, 35(6), 763-783.

Peterson, N., Hull, V., Mertib, A., & Liu,, J. (2008). Evaluating household-level relationship between environmental views and outdoor recreation: The Treton Valley Case. *Leisure Sciences*, 30, 293-305.

Redfearn, J. (1999). OECD to set up global facility on biodiversity, *Science*, 285(5424), 22-3.

Ryan, R.L. (2005). Exploring the effects of environmental experience on attachment to urban natural areas. *Environment and Behavior,* 37(1), 3-42.

Scribner, S., & Cole, M. (1973). Cognitive consequences of formal and informal education. *Science,* 182(4112), 553-559.

Schultz, J.R., Simpson, S., Elfessi, A.M. (2011). The environmental action and philosophy matrix: an exploratory study of the environmental attitudes of recreation management and environmental studies students. *The Journal of Environmental Education,* 42(2), 98-108.

Schutt, Russell K. (2015) Investigating the Social World: The Process and Practice of Research, 8th edition. Thousand Oaks, CA: Pine Forge Press.

Swaim, J., Maloni, M.J., Napshin, S.A., & Henley, A.B. (2014) Influences on student intention and behavior toward environmental sustainability. *Journal of Business Ethics,* 124, 465-484.

Tal, T., & Abramovitch, A. (2013). Activity and action: Bridging environmental sciences and environmental education. *Research in Science Education,* 43, 1665-1687.

Tarrant, M.A., & Cordell, H.K. (1997). The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environment and Behavior,* 29(5), 618-637.

Thapa, B. (2010). The mediation effect of outdoor recreation participation on environmental attitude behavior correspondence. *The Journal of Environmental Education*, 41(3), 133-150.

Uysal, M., Jurowski, C., Noe, F.P., & McDonald, C.D. (1994). Environmental attitude by trip and visitor characteristics. *Tourism and Management,* 15(4), 284-294.

Vicente-Molina, M.A., Fernandez-Sainz, A., & Izagirre-Olaizola, J. (2013). Environmental knowledge and other variables affecting pro-environmental behaviour: Comparison of University Students from Emerging and Advanced Countries. *Journal of Cleaner Production*, 61, 130-138.

Yale University. (2014). Environmental Performance Index [Country rankings]. Retrieved from http://epi.yale.edu/epi/country-rankings.

Yueh, H.P., Chang, C.C., & Lian, C. (2013). Are there differences between science and engineering majors regarding the imagination-mediated model? *Thinking Skills and Creativity,* 10, 79-90.

Wang, P., Liu, Q., & Qi, Y. (2014). Factors influencing sustainable consumption behaviors: a survey of the rural residents in China. *Journal of Cleaner Production.* 63, 152-165.

Westphal, J., & Wesleyf, H. (1986). Assessing the long-term effects of an environmental education program: a pragmatic approach. *The Journal of Environmental Education*, 17(2), 26-30.

Woodworth, B.L., Steen-Adams, M.M., & Mittal, P. (2011). Role of an environmental studies course on the formation of environmental worldviews: a case study of a core curriculum requirement using the NEP scale. *The Journal of Environmental Studies and Sciences,* 1, 126-137.

Wu, L. (2012). Exploring the New Ecological Paradigm Scale for Gauging Children's Environmental Attitudes in China. *The Journal of Environmental Education*, 43(2), 107-120.

Zelezny, L.C., Poh-pheng, C., & Christina, A. (2000). New ways of thinking about environmentalism: Elaborating on gender differences in environmentalism. *Journal of Social Issues,* 56(3), 443-457.

APPENDIX

APPENDIX A: IRB APPROVAL

PU

Protocol #: 1601016995
Investigator: SHEPARDSON, DANIEL P
Status: Exempt
Expiration Date:
Last Approval Date:
Sequence Number: 1

Purdue University
IRB Protocol Summary

Protocol Details

Title: What is the relationship between environmental experiences, environmental behavior, and environmental paradigm?

Protocol Type: Request for Exemption

Application Date: 01/15/2016

Reference Num 1:

Organizations

Type	Organization	Address
Performing Organization	Purdue University	Purdue University 155 S GRANT STREET WEST LAFAYETTE IN - 479072114 USA

Investigators

Person Name	Units		Affiliate	Training Flag
SHEPARDSON, DANIEL P	42003000	Curriculum & Instr	Faculty	N

Study Personnel

PersonName	Role	Affiliation	Training
KIM, MIYEN	Researcher	Key Personnel	N

Type	Name	Comments
Study/Research Personnel	SHEPARDSON, DANIEL P	

Areas of Research

Code	Description
000001	All Research Areas

Funding Source

Type	Number/Code	Name/Title
Other-Self Funded	no funding needed	

APPENDIX B: INVITATION EMAIL SAMPLE

Participate in Environmental Experience Survey

Dear participant,

You have been identified as a key person to be a participant among Purdue University undergraduate students to participate in the survey to find the relationship among environmental experiences, behavior, and paradigm.

We are seeking your feedback about your environmental experiences, behaviors and paradigm.

The purpose of the study is to investigate the relationship between an individual's environmental experiences and an individual's environmental behavior and paradigm. If a relationship between environmental experiences and environmental behavior and paradigm can be drawn, the findings might have influence on environmental education.

Below is a link to the online survey. Your responses will be kept completely confidential. This study will be conducted at Purdue University using survey research. The research data will be collected using Qualtrics. The survey is user-friendly and you should be able to complete it within 15-20 minutes or less. However, for your convenience, you are allowed 1 week to complete your responses in case you are unable to complete all your response at once.

We appreciate your willingness to participate and value your feedback. Our hope is this process will help educators who teach and seek to find different methods to teach environmental education and also to have positive influence on environment in the long-term.

If you have any questions, please contact Mi Yen Kim (kim1870@purdue.edu).

To begin, please click the survey URL below:

Survey URL: https://purdue.qualtrics.com/SE/?SID=SV_eytTJN2maFBZf5H
Thank you for your participation.

Mi Yen Kim

APPENDIX C: QUESTIONNAIRE SAMPLE

1. Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose and benefits of the study and how it will be conducted.

Researcher Mi Yen Kim
Masters of Science
Purdue University

Purpose of the Study
The purpose of the study is to investigate the relationship between an individual's environmental experiences and an individual's environmental behavior and paradigm. If a relationship between environmental experiences and environmental behavior and paradigm can be drawn, the findings might have influence on environmental education.

Description of the Study
This is a survey study to identify environmental experiences that may have influenced an individual's environmental behavior and paradigm

Procedure to be Used
This study will be conducted at Purdue University using survey research. The research data will be collected using Qualtrics

Description of Foreseeable Risks
The researcher guarantees confidentiality and no publication with individual's answers, there are no foreseeable risks in this research.

Benefits to the Subjects or Others
The audiences that will likely profit from a study of the research problem will be educators who teach and seek to find different methods to teach environmental

education. The study will also help the general public in the long term. There will be no benefit to subjects.

By clicking YES you are verifying that you have read the explanation of the study, and that you agree to participate. You also understand that your participation in this study is strictly voluntary.

○ Yes ○No

2. What is your gender

○Male ○No

3. What is your class rank?

○ Freshman ○Sophomore ○ Junior

○Senior ○ Others (please specify)

4. What is your college? (choose all that apply)

☐College of Engineering ☐College of Health & Human Sciences

☐College of Liberal Arts ☐College of Science

☐Krannert School of Management

5. What is your major in College of Engineering? (choose all that apply)

☐Aerospace and Astrophysics Engineering ☐Biomedical Engineering

☐Chemical Engineering ☐Civil Engineering

☐Computer Engineering ☐Construction Engineering

☐Electrical Engineering ☐Engineering

☐Environmental and Ecological Engineering ☐First Year Engineering

☐Industrial Engineering ☐Interdisciplinary Engineering Study

☐Materials Science and Engineering ☐Mechanical Engineering

☐Multidisciplinary Engineering ☐Nuclear Engineering

6. What is your major in College of Health and Human Sciences? (choose all that apply)

☐Accelerated Nursing ☐Apparel Design and Technology

☐Applied Exercise and Health ☐Athletic Training

☐Brain and Behavioral Science ☐Coordinated Dietetics

☐Developmental and Family Science ☐Diadactic Dietetics

☐Dietetics/Nutritional Fitness and Health ☐ECE and Exceptional Needs

☐Environmental Health Science

☐Family and Consumer Science Education

☐Financial Counseling and Planning ☐Foods and Nutrition in Business

☐Health and Fitness ☐Health Education

☐Health Science PreProfessional ☐Health/Physical Education

☐Hospitality and Tourism Managemen ☐Human Services

☐Medical Laboratory Sciences ☐Movement and Sport Sciences

☐Nursing ☐Nutrition Science

☐Nutrition, Fitness and Health ☐Occupational Health Science

☐Physical Education ☐Pre Applied Exercise and Health

☐Pre Athletic Training ☐Pre Psychology

☐Psychological Sciences ☐Psychology

☐Public Health ☐Public Health Promotion

☐Public Health Promotion Concentration ☐Radiological Health Pre-MP

☐Radiological Health Sciences ☐Retail Management

☐Selling and Sales Management

☐Speech, Language and Hearing Science

☐Speech, Language, and Hearing Pre-Professional

7. What is your major in College of Liberal Arts? (choose all that apply)

☐African American Studies
☐American Studies
☐Anthropology
☐Anthropology Honors
☐Art History
☐Asian Studies
☐Classical Studies
☐Comm-Human Relations
☐Comparative Literature
☐Corporate Communication
☐Creative Writing
☐Economics
☐English
☐English Education
☐Film/Video and Theatre Production
☐Fine Arts Concentration
☐French
☐General Communication
☐General Undecided
☐German
☐History
☐History Honors
☐Industrial Design Professional Program
☐Interdisciplinary Film/Video
☐Interior Design Professional Program
☐Japanese
☐Law and Society
☐Law and Society Honors
☐Linguistics
☐Mass Communication
☐Medieval/Renaissance Study
☐Organizational Communication
☐Philosophy
☐Photo and Related Media
☐Political Science
☐PR and Strategic Communication
☐Pre Communication
☐Pre Economics

☐Professional Writing

☐Public Relation and Rhetorical Advocacy

☐Religious Studies ☐Russian

☐Sociology ☐Sociology Honors

☐Sound for the Performing Arts ☐Spanish

☐Studio Arts and Technology ☐Theatre Acting

☐Theatre Concentration ☐Theatre Design and Production

☐Visual Arts Design Education ☐Visual Arts Education

☐Visual Communications ☐Women's Studies

8. Wat is your major in Krannert School of Management? (choose all that apply)

☐Accounting ☐Advanced Accountancy

☐Economics ☐Finance

☐IM/Analytical Consulting ☐IM/Computer Science

☐IM/Economics ☐IM/Engineering

☐IM/Financial Engineering ☐IM/Manufacturing Management

☐IM/Management Info Systems

☐IM/Operational and Supply Chain Management

☐IM/Operations Management ☐IM/Quantitative Methods

☐IM/Science, Technology, Engineering and Math

☐IM/Science ☐Industrial Management

☐Management ☐Marketing

☐Pre Economics ☐Pre Management/Accounting

☐Pre Management/Industrial Management ☐Pre Management/Management

☐Pre Strategy and Organization Management

☐Pre-Finance ☐Pre-Marketing

☐Pre-Supply Chain Info/Analytics

☐Strategy and Organization Management ☐Supply Chain Info and Analytics

9. What is your major in College of Science? (choose all that apply)

☐Actuarial Science ☐Actuarial Science Honors

☐Applied Physics ☐Applied Statistics

☐Atmospheric Science ☐Biochemistry (Biology)

☐Biochemistry (Chemistry) ☐Biochemistry Honors

☐Biology ☐Biology Education

☐Cell, Molecular and Development Biology ☐Chemistry

☐Chemistry (ACS) ☐Chemistry Education

☐Computer Science ☐Computer Science Honors

☐Earth Space Science Education

☐Ecology, Evolution and Environmental Biology

☐Environmental Geoscience ☐Genetics

☐Geology and Geophysics ☐Health and Disease

☐Interdisciplinary Science ☐Math/Operations Research

☐Mathematics ☐Mathematics Education

☐Mathematics Honors ☐Mathematics-Computer Science

☐Mathematics/Business ☐Mathematics/Statistics

☐Microbiology ☐Neurobiology and Physiology

☐Physics ☐Physics Education

☐Physics Honors ☐Planetary Sciences

☐Science ☐Statistics-Math Emphasis

☐Undesignated

10. What is your ethnicity?

○American Indian or Alaska Native ○Asian

○Black or African American ○Hispanic/Latino

○Native Hawaiian or Other Pacific Islander ○White

○International

○2 or more races (please specify)

○Other (please specify)

11. In which state did you receive MOST of your education? (Elementary, Junior High, and High School)

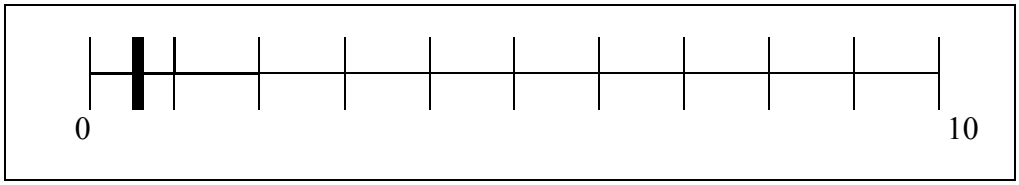
○I did not receive education in the United States prior to college

○Alabama	○Alaska	○Arizona	○Arkansas
○California	○Colorado	○Connecticut	○Delaware
○Florida	○Georgia	○Hawaii	○Idaho
○Illinois	○Indiana	○Iowa	○Kansas
○Kentucky	○Louisiana	○Maine	○Maryland
○Massachusetts	○Michigan	○Minnesota	○Mississippi
○Missouri	○Montana	○Nebraska	○Nevada
○New Hampshire	○New Jersey	○New Mexico	○New York

○North Carolina	○North Dakota	○Ohio	○Oklahoma
○Oregon	○Pennsylvania	○Rhode Island	
○South Carolina	○South Dakota	○Tennessee	
○Texas	○Utah	○Vermont	○Virginia
○Washington	○Washington D.C.	○West Virginia	○Wisconsin
○Wyoming			

12. In which country did you receive MOST of your education? (Elementary, Junior High, and High School)?

13. If you score your environmental behavior, what score would you give yourself? (Slide the pointer)



14. How often do you do these activities?

Answer choices: 0 = Never, 1 = Hardly ever, 2 = Seldom, 3 = Sometimes, 4 = Generally, 5 = Frequently, 6 = Always.

	Question	0	1	2	3	4	5	6

14.1	I recycle	○	○	○	○	○	○	○
14.2	I talk to people about the environment	○	○	○	○	○	○	○
14.3	I try to learn new ways to help the environment	○	○	○	○	○	○	○
14.4	I help people do what is good for the environment	○	○	○	○	○	○	○
14.5	I use green products	○	○	○	○	○	○	○
14.6	When I hear about new ways to help the environment, I try to use do that	○	○	○	○	○	○	○
14.7	I shop at farmers market	○	○	○	○	○	○	○
14.8	I turn the lights off when the room is not in use	○	○	○	○	○	○	○
14.9	I keep my garbage with me until I can find a garbage can or recycling bin	○	○	○	○	○	○	○
14.10	I drive to school or work	○	○	○	○	○	○	○
14.11	I keep my thermostat at 68°F in the winter to conserve energy	○	○	○	○	○	○	○
14.12	I keep my thermostat at 76°F in the summer	○	○	○	○	○	○	○
14.13	I vote for political figures based on their environmental perspective	○	○	○	○	○	○	○
14.14	I feed and provide water to birds	○	○	○	○	○	○	○
14.15	I try to live more sustainably	○	○	○	○	○	○	○

14.16	I have planted a vegetable garden	○	○	○	○	○	○	○
14.17	I donate to environmental groups	○	○	○	○	○	○	○
14.18	I garden/landscape with local plants	○	○	○	○	○	○	○
14.19	I help to pick up trash along rivers, lakes and/or in parks	○	○	○	○	○	○	○
14.20	I eat meat	○	○	○	○	○	○	○
14.21	I plan trips to reduce driving	○	○	○	○	○	○	○
14.22	I buy green products	○	○	○	○	○	○	○
14.23	I explain to my friends why I do/do not recycle	○	○	○	○	○	○	○
14.24	I have convinced my friends to recycle	○	○	○	○	○	○	○
14.25	I turn off the water between brushing my teeth	○	○	○	○	○	○	○
14.26	I wait until I have a full laundry before I wash my clothes	○	○	○	○	○	○	○

15. What is the MOST important source of your environmental knowledge? (drag and drop - RANK the following in order of importance)

○Media

○Web

○School/Classes

○Friends

○Afterschool environmental programs

○Being out in nature

○Books

○Published research papers

○I don't know

16. Do you garden?

○ Yes ○No

17. When you garden, do you use fertilizers?

O Yes ONo

18. When you garden, do you use pesticides?

O Yes ONo

19. Do you use a dishwasher?

O Yes ONo

20. Do you wait until your dishwasher is full to wash your dishes?

O Yes ONo

21. Have you taken an environmental related course in college?

O Yes ONo O Not sure

22. Have you ever taken an environmental field trip in school? (Including elementary, junior high, high school, and college)

O Yes ONo O Not sure

23. If our city does not provide recycling, would you go to the recycling station to recycle?

O Yes ONo

24. Have you ever been a member of an environmental club or an organization?

O Yes ONo

25. Which source of environmental information MOST affects your environmental behavior? (drag and drop - RANK the following in order of importance)

- ○Media
- ○Web
- ○School/Classes
- ○Friends
- ○Afterschool environmental programs
- ○Being out in nature
- ○Books
- ○Published research papers
- ○Nothing affects my environmental behavior

26. How often do you visit a local or neighborhood park?

○Never ○1-5 times a year ○6-10 times a year

○11-12 times a year ○ more than 15 times a year

27. Have you ever been to a national park?

○ Yes ○No

28. How many times have you visit a national park in the past 5 years?

○Never ○1-5 times a year ○6-10 times a year

○11-12 times a year ○ more than 15 times a year

29. Have you ever birdwatched?

○ Yes ○No

30. How often do you go birdwatching?

○Daily	○Once a week	○Once a month
○3 or 4 times a year	○Twice a year	○Once a year
○Never		

31. Have you ever participated in a nature conservation activity, such as monitoring water quality, or species and habitat restoration?

○ Yes ○No

32. Which of the following prevents you from volunteering in a nature conservation activity? (Choose all that apply)

○Unaware of the opportunity	○Unable to get to the place	○Lack of time
○Cost	○Personal choice	○Not interested

33. Which outdoor activities do you enjoy? (Choose all that apply)

☐Camping	☐Canoeing	☐Fishing
☐Hiking	☐Hunting	☐Kayaking
☐Nature Photography	☐Nature Painting	☐Picnicking
☐Relaxing outdoors	☐Skiing	☐Snowboarding
☐Surfing	☐Swimming	
☐Others (please specify)		

34. Have you attended a nature and/or environmental talk in the past year?

○ Yes ○No

35. Have you attended a nature and/or environmental festival in the past 5 years?

O Yes ONo

36. Have you visited a nature exhibit in the past 5 years?

O Yes ONo

37. Have you visited a nature museum in the past 5 years?

O Yes ONo

38. Have you visited a zoo in the past 5 years?

O Yes ONo

39. Have you ever had an environmental related job?

O Yes ONo

40. Do you know about your ecological footprint?

O Yes ONo O Not sure

41. Do you agree or disagree?

Answer choices: 1 = Hardly ever, 2 = Seldom, 3 = Sometimes,

4 = Generally, 5 = Frequently, 6 = Always.

Questions		1	2	3	4	5
41.1	We are approaching the limit of the number of people the earth can support	○	○	○	○	○
41.2	Humans have the right to modify the natural environment to suit their needs	○	○	○	○	○
41.3	When humans interfere with nature it often produces disastrous consequences	○	○	○	○	○
41.4	Human ingenuity will insure that we do not make the Earth unlivable	○	○	○	○	○
41.5	Humans are seriously abusing the environment	○	○	○	○	○
41.6	The Earth has plenty of natural resources if we just learn how to develop them	○	○	○	○	○
41.7	Plants and animals have as much right as humans to exist	○	○	○	○	○
41.8	The balance of nature is strong enough to cope with the impacts of modern industrial nations	○	○	○	○	○
41.9	Despite our special abilities, humans are still subject to the laws of nature	○	○	○	○	○
41.10	The so-called "ecological crisis" facing humankind has been greatly exaggerated	○	○	○	○	○
41.11	The Earth is like a spaceship with very limited room and resources	○	○	○	○	○
41.12	Humans were meant to rule over the rest of nature	○	○	○	○	○
41.13	The balance of nature is very delicate and easily upset	○	○	○	○	○
41.14	Humans will eventually learn enough about how nature works to be able to control it	○	○	○	○	○
41.15	If things continue on their present course, we will soon experience a major ecological catastrophe	○	○	○	○	○

VITA

VITA

Mi Yen Kim

EDUCATION

Purdue University (December 2016)
Master of Science in Earth Atmosphere and Planetary Sciences
Concentration in Science Education
University of Illinois at Urbana-Champaign (May 2014)
Bachelor of Science in Geology
Concentration in Environmental Geology

WORK AND TEACHING EXPERIENCE

Purdue University (August 2014-December2016)
Teaching Assistant

- Assisted in teaching environmental science to elementary education major students
- Assisted in developing a SmartBoard teaching tool used in classrooms

Jesus-Love United Methodist Church (August 2010-May 2014)
Sunday school Teacher

- Collaborated effective teaching styles and developed different lesson plans to motivate different students

University of Illinois at Urbana-Champaign (September 2011-December2012)
Geobiology Research Assistant/Internship

- Assisted in constructing an environment for a project with Uranium effect on soil remediation
- Specialized in creating medium for the entire project of 30+ liters using lab equipment and chemicals
- Created different types of cultures such as Lovelyei and Geobacter using autoclave

Korea Institute of Ocean Science Technology (July 2013-August 2013)
Summer Internship

- Assisted in analyzing the appropriate fields for the Carbon Capture and Storage Sites in Korea
- Specialized in translating documents from International Energy Agency to compare data from different countries

ANT21 Corporation (June 2010-August 2010)
Summer Internship

- Analyzed the performance of diffusers in two wastewater sites in Korea
- Presented and introduced the company's product at Inno-Tech Show 2010, which involved over 100 businesses